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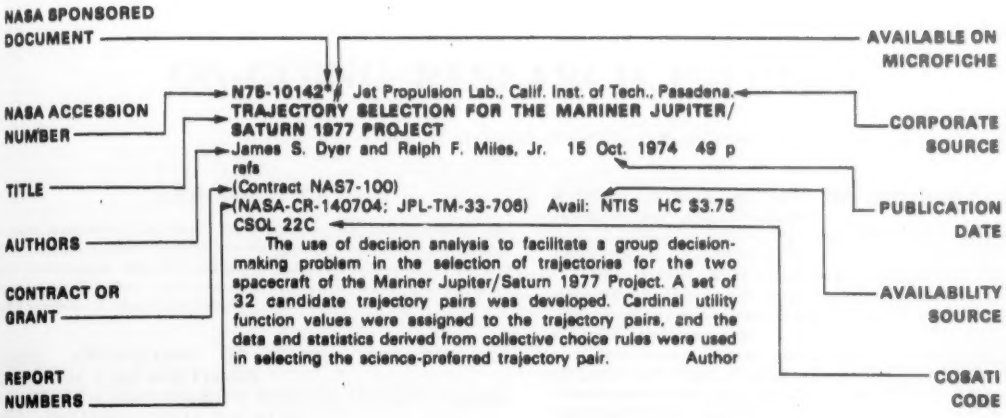
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N75-10142*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
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TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
TITLE
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
PUBLICATION DATE
AUTHORS
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CONTRACT OR GRANT
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
AVAILABILITY SOURCE
CSOL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author
REPORT NUMBERS
COSATI CODE

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, APPLICATION OF FINITE ELEMENTS TO TRANSONIC CASCADE FLOWS

S.T. CHAN, Lockheed Missiles & Space Co., *Huntsville, Alabama* 35807 (DF135510; F33615-75-C-3125)

Recent designs of high performance aircraft have indicated a need for more accurate prediction of aeroelastic phenomena inside turbine engines. The objective of this effort is to improve reliability and safety of turbine-powered military flight vehicles. Cost estimates to eliminate a flutter problem in a fleet of 1000 production engines are as much as $19 million. An accurate flutter prediction method could find the problem before the production phase, thus lowering costs and increasing reliability. This effort will focus on providing the aerodynamics for an accurate AFFDL blade flutter analysis capability to evaluate the flight safety of new turbine-powered aircraft.

The contractor shall adapt newly developed finite element methods for transonic aerodynamic calculations to cascades, developing a transient numerical integration technique to allow non-simple harmonic motion calculations to be made. A second task requires the contractor to incorporate the method into a computer program. Anticipated problems include the task of assuring that the program is compatible with the WPAFB computer facility.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0002, PERFORMANCE OF OPEN GRADED BITUMINOUS MIXES ON AIRFIELD RUNWAYS

P.K. PURDAM, Australian Dept. of Hous., *Hawthorne, Victoria 3122, Australia* (115568 (HRB NO.))

The purpose is to evaluate the effectiveness, life and cost of open graded bituminous mixes as anti-skid surfaces on airfield runways in the Australian environment. /IRF/

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY Australian Government - Canberra

1.0003, QUEUEING PHENOMENA AT SYDNEY INTERNATIONAL AIRPORT

M.C. DUNEE, Univ. of New South Wales, School of Transport. & Traffic, *Kensington, New So. Wales 2033, Australia* (115496 (HRB NO.))

Study of internal road traffic movements in the Sydney International Airport with particular reference to check-in departure lounge and baggage handling facilities.

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY University of New South Wales - Australia

1.0004, AERIAL ESCAPE AND RECOVERY SYSTEMS HARDWARE COMPONENTS

J.W. TURNER, U.S. Navy, Aerospace Recovery Facil., *El Centro, California* 92243 (DN937027)

Provide new and/or upgraded parachute and recovery system components. Design and develop a parachute release compatible with all other Navy ejection/restraint systems, with a view to more reliability and lower cost.

Review past, present and proposed hardware design and associated equipment, complete the preliminary design(s), conduct development tests and evaluate results. Finalize design and data package for procurement action.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0005, STABILITY AND CONTROL DATCOM REVISION

R.D. FINCK, McDonnell Douglas Corporation, *Long Beach, California* 90808 (DF135050; F33615-75-C-3067)

Rapidly changing technology dictates that improvements be made in the USAF stability and control DATCOM if it is to retain its value as a source of current design information for military aerospace vehicles. This objective is for continual examination of all pertinent available data and theories, and improved and newly formulated prediction methods must be integrated into the DATCOM as soon as their value has been recognized and their validity substantiated. The coverage of recent findings in the V/STOL area and in the prediction of external store effects in stability and control is especially critical.

Experimental data and prediction methods relating to V/STOL and external store effects will be evaluated and integrated into the DATCOM. Specific information will be presented with each DATCOM method to indicate its range of applicability, limitations, accuracy, and deviation. Methods will be substantiated by tables such as those in the existing DATCOM. Both ground and flight test data will be included, and sample problems will be provided for all DATCOM methods presented.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0006, NOISE AND SONIC FATIGUE OF HIGH LIFT DEVICES

H.L. LEVY, McDonnell Douglas Corporation, *Long Beach, California* 90808 (DF133910; F33615-75-C-3057)

Current Air Force interest in STOL aircraft includes designs using externally blown flaps with over the wing and under the wing blowing. Other concepts such as internally blown flaps, augmentor wing, cold thrust augmentation with hypermixing nozzles, etc., are also being investigated. Noise predictions for these concepts indicate intense noise levels will be generated and will result in potential problems associated with community noise, sonic fatigue, and internal noise. The objective of this effort is to investigate selected high lift or thrust augmentation systems as they pertain to noise generation and to define the associated noise field as it relates to performance and engine operating parameters. The results of this study will assist aircraft designers in obtaining reliable, maintenance-free structures, and will permit selection and design of concepts with reduced noise.

Powered lift and thrust augmentation systems will be reviewed and practical systems design parameters will be determined. Consideration will be given to thrust, by-pass ratio, mass flow, exit velocity, exit temperature, jet diameter, engine flap geometry, engine flap spring, etc. From the above study the most promising configuration will be selected for further investigations including both analytical and experimental phases. Model studies will be conducted investigating the practical range of design parameters to determine the acoustic loading for near field noise, and infra-sound effects.

Supporting agency address information: AF Flight Dynamics Laboratory FYA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0007, PERFORM A STUDY OF THE SENSITIVITY OF CONTROL POWER REQUIREMENTS FOR STATISTICALLY UNSTABLE FIGHTER AIRCRAFT

A.L. GREENSITE, General Dynamics Corporation, *San Diego, California* 92112 (DN590039; N00019-75-C-0355)

A driving factor in the control power requirements of the aerodynamically unstable aircraft is its susceptibility to upset following external disturbances, such as winds and gusts. The objective is to obtain data useful in arriving at rational design criteria and margins of safety needed for control power in aerodynamically unstable aircraft.

The contractor will determine critical flight conditions for two aerodynamically unstable aircraft configurations. Gust upset boundaries will be established for each configuration by time history response to discrete gust modes. Gust amplitude shall be correlated to the probability of occurrence through the continuous random model and discrete gust response will be compared to the continuous random gust response.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0008, MIXING AND COMBUSTION MECHANISMS IN HIGH SPEED AIR FLOWS

R. EDELMAN, R & D Associates, *Santa Monica, California* (DF040850; F44620-75-C-0065)

For weapons delivery at hypersonic speeds, advanced air-breathing propulsion engines incorporating high speed combustion capable of wide flight range operation are required. Combustors involving recirculation phenomena (e.g., sudden expansion or dump burners) are of particular interest. This research responds to RO 5.2 and will aid in engineering design and development of ignition systems and combustion chambers for these engines. This program involves formulation and evaluation of theories describing chemical kinetics and mixing phenomena in subsonic and supersonic fuel-air flows. Included will be investigation of transport phenomena in nonreacting and reacting flows. Mechanisms will be studied for accelerating and enhancing mixing and combustion processes to minimize length combustion completion, including coupled chemical and mass transport processes with pressure distribution and geometric effects. Effects of sudden expansion (e.g., combustor area and step size, pressure, and flow variations) and effects of interphase transport (e.g., particulate phase evaporation, combustion and diffusion) on injection and mixing, ignition, flame stabilization and propagation, and on combustion instabilities and efficiency will be studied. Also studied will be coupling of mechanisms describing ignition, combustion and mixing processes associated with direct injection of multiphase fuels into high speed air streams.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0009, NAVY ENVIRONMENT - DEVELOPMENT OF EFFICIENT COASTAL DATA STRUCTURES FOR APPLICATION TO GEOGRAPHICAL DISORIENTATION AND OTHER PROBLEMS

T.K. PEUCKER, Simon Fraser University, *Burnaby, British Columbia, Canada* (DN223712; N00014-73-C-0109)

The innovations and improvements in procedures for structuring coastal environmental data that are being sought through this research contribute to solutions of such naval and Marine Corps problems as flyer disorientation, reconnaissance imagery processing, and rapid terrain analysis to identify routes, potential airfields, and hazards. The procedures stress speed and information content integration.

Research focus is on development of flexible data structure for coastal geographic data, based on two systems: an approximation of terrain by sets of triangular pyramids, and a verification of essential features by determining the ridge lines and the channel lines including their extensions to passes. Possible flight paths are investigated under assumptions of accurate heights and of approximate heights with a possible shift of all height measures. The problem of data input through high altitude radar images will be studied on a preliminary basis.

Supporting agency address information: Office of Naval Research 462, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0010, ANALYSIS OF ENGINE FAN NOISE

Y.K. LIN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The far field noise generated by an inlet fan of a jet engine is investigated theoretically. Preliminary results indicate that dipole distribution on fan blades is of minor importance. Present efforts are directed toward the monopole sources and the shear noise from the interaction of non-uniform main axial flow and turbulence. The random perturbation of fan blade spacing is also taken into consideration.

SUPPORTED BY University of Illinois

1.0011, B-52B (008) SERVICE LIFE STUDY

E.E. PRATER, Boeing Company, *Wichita, Kansas* (DF134870; F33615-75-C-3064)

The presently proposed X-24C research vehicle program is predicated upon the use of the air launch platform and technique common to previous lifting body research programs. It is the objective of this work effort to provide for an evaluation of the remaining service utility of the present research vehicle launch platform, B-52 (008), and an assessment of the extent of modernization/modification required to insure that it will be capable of supporting research vehicle launch operations through the 1985 time period.

This work effort shall entail a sole source contract to assess the reliability, supportability and operational utility of the present launch vehicle, B-52B (008), and its subsystems. These attributes shall then be projected to 1985 so as to assess the practicality of using B- 52B (008) as a launch vehicle through that time frame. Those subsystems ascertained to be of marginal reliability, supportability, or operational utility as a result of this analysis shall be identified and alternative modifications or replacement items suggested so as to bring the vehicle operational reliability to a level commensurate with its intended mission and safe operation.

Supporting agency address information: AF Flight Dynamics Laboratory FXS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0012, STATISTICAL TECHNIQUES FOR ENGINE REMOVALS

L. GEORGE, Univ. of Louisville, School of Engineering, *Louisville, Kentucky* 40208 (DF214900; F33615-75-C-1083)

AF function - techniques for forecasting removals of high-cost engines. Deficiency - need for mathematical re-evaluation of actuarial method as currently applied to the aircraft engine environment. Research - seek improved or new statistical technique(s). How research contributes - more accurate (or cheaper) computations of engine requirements, better planning for depot overhaul and base repair workloads.

The current Air Force method calculates actuarial failure rates (provided the engine service life has not exceeded a stipulated maximum). These failure rates are age-dependent conditional probabilities of engine removals due to usage failures.

While this statistical insurance-risk procedure tacitly assumes large populations, the general trend over the past twenty years has been to reduced engine populations. Therefore, the validity of this condition and other assumptions underlying the actuarial method are questioned. Also the actuarial procedure requires elaborate and costly reporting procedures of data collection, a substantial workload, with no assurance that the quality of the data collected will be good. The proposed method should have desirable properties such as mathematical tractability, some empirical basis, and variables or parameter estimates whose numerical values are easily obtainable from the current engine logistics system. (Its ultimate implementation into the engine system should not be unduly complicated, excessively expensive, or require inordinate amounts of training and labor.) Criteria to be satisfied are - results should be comparable in accuracy with the current Air Force method but at less cost in data processing. The approach to develop these techniques must be accomplished within the framework of the present Air Force data collection system.

Supporting agency address information: Aerospace Research Laboratory LB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0013, HIGH-FREQUENCY SWEPT-SPECTRUM COMMUNICATIONS /HFSSC/
T.J. ELKINS, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF246280)

AF function - survivable communications. Deficiency - need for reliable essential long range communications under natural or nuclear ionospheric disturbance. Research - study effects of naturally occurring ionospheric disturbance in high latitudes upon swept spectrum high frequency (HF) modulated signals. How research contributes - the research will verify the feasibility of a new kind of minimum essential long range communications under realistic conditions. An aircraft receiver will be used, flying in the polar regions along paths specially chosen so as to investigate effects of various ionospheric propagation anomalies. Data will be provided to assist in possible system design.

In FY76 a series of flights is planned in which special equipment, constructed and installed in the KC-135 in FY75, will receive transmission from Utah. The transmissions will consist of a modulated highly-linear swept-frequency carrier, the receiver will be synchronized with the transmitter. An on-board computer will decode the transmissions and perform statistical analysis of the demodulated data.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0014, SLANT VISUAL RANGE MEASURING EQUIPMENT TECHNIQUES
E.Y. MOROZ, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243790)

AF function - navigation and weapons delivery functions of strategic, tactical, air defense, and airlift forces. Deficiency - the requirement for a slant range visibility measuring system for airfield use is stated in MAC ROC 3-73. Objective - the objective is to develop a lidar slant range visibility measuring system to determine visibility in the approach zone under category I, II and III-A operations. How development contributes - a lidar slant visual range system will provide for safe and efficient aircraft operations at airfields.

An experimental SVR measuring system and real time data processor will be field tested. Comparisons will be made with simultaneous slant path transmission measurements. Time and space measurements of the visibility field collected during slant visual range experiments will be analyzed to determine the optimum operational configuration and data acquisition rate for a lidar slant visual range measuring system. The study will also determine which type of visibility information best characterized for IHWU 6670-04-01 (dated) 28 June 1974 - the pilot, the slant visual range, and its variability in the approach zone.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0015, THE OPTICAL CONVOLUTION ANEMOMETER
M. RUDD, Bolt Beranek & Newman Inc., *Cambridge, Massachusetts* 02138 (DF135040; F33615-75-C-3085)

Current airspeed indicating systems for military aircraft are accurate to a minimum speed indication of approximately 50 knots. Present sensing system errors in the low speed range are significant and are of sufficient magnitude to cause safety of flight problems when hovering or approaching landing for V/STOL vehicles. The objective is to study/develop a system that is capable of sensing and displaying accurately the airspeed parameter in the low airspeed range of a V/STOL type aircraft.

The Air Force Flight Dynamics Laboratory has been developing various time of flight sensing techniques for velocity measurement. Of particular promise in the effort is the optical convolution velocimeter. This device has been submitted as a patent disclosure and presented at the laser Doppler workshop at Purdue University on Mar 74. The suggested approach is to develop an appropriate theory describing the device, optimize design, and fabricate a prototype based upon this work, and then to test the system. This approach has been suggested in an unsolicited proposal from Bolt, Beranek, and Newman, Inc., of Cambridge, Massachusetts.

Supporting agency address information: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0016, FLIGHT PERFORMANCE OF GLIDING DECELERATOR SYSTEMS
T.F. GOODRICK, U.S. Army, Natick Development Center, *Natick, Massachusetts* 01760 (DA0G4226)

To analyze the factors necessary to achieve satisfactory flight performance of gliding decelerator systems used to airdrop troops and supplies under exceptional circumstances.

Various analytical techniques and some experimentation will be used to study the various aspects of gliding flight with flexible decelerators and the interrelations of the various aspects. In addition to steady flight characteristics, unsteady flight characteristics such as transition from opening to guided gliding path, response to control actuation, response to wind perturbation and performance of transient landing maneuvers will be studied.

Supporting agency address information: TROSCOM Natick Development Center, Natick, Ms 01760

SUPPORTED BY U.S. Dept. of Defense - Army

1.0017, NAVY VEHICLE DESIGN AND CONSTRUCTION - HIGH ANGLE OF ATTACK STABILITY AND CONTROL DEVELOPMENT
R. STENGEL, Analytic Sciences Corporation, *Reading, Massachusetts* 01867 (DN575168; N00014-75-C-0432)

At high angle of attack (HAOA) the flying qualities of most current high performance combat aircraft degenerate due to undesirable characteristics such as wing rock and departures from controlled flight (pitch, yaw, and roll divergence). These characteristics can significantly reduce tracking capability, impair maneuverability and lead to loss of control and difficult recovery problems. The objective of this task is to develop an analytic framwork for the study of HAOA stability and control behavior and to identify general rules for the design of departure-preventing control systems.

Nonlinear and time-varying system criteria incorporating detailed aerodynamic and pilot models will be used to derive generalized stability boundaries of high performance aircraft at high angles of attack. The analytic methods developed will be applied to determine the high angle of attack stability and departure characteristics of a representative Navy aircraft.

Supporting agency address information: Office of Naval Research, Arlington, Va 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0018, NICKEL-ZINC BATTERY FOR AIRCRAFT AND MISSILE APPLICATIONS
E. BROGLIO, Eagle Picher Industries Inc., *Joplin, Missouri* 64801 (DF457360; F33615-75-C-2004)

The objectives of this effort are twofold. First, develop the necessary technology and demonstrate performance under simulated aircraft conditions of a rechargeable nickel-zinc battery as a lightweight, high discharge rate, low initial and life cycle cost source of DC electrical power which has moderate low temperature performance capability and charge/discharge cycle life. Second, develop the necessary technology and demonstrate performance under simulated missile applications of a low cost, automatically activated, nickel-zinc primary battery in existing hardware which has been used for similar silver zinc batteries.

This effort is based on the desire to compare the performance of alkaline nickel-zinc batteries with lead-acid, alkaline nickel-cadmium and/or alkaline silver-zinc batteries of a similar design and type for aircraft, RPV, and missile applications.

Supporting agency address information: AF Aero-Propulsion Laboratory POE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0019, TIME DEGRADATION OF TURBINE ENGINE EMISSION FACTORS
D. BAUERLE, Trans World Airlines, *Kansas City, Missouri* 64195

Description: Measurement of exhaust emission rates from specific JT8D-9 engines installed on TWA 727-231 model aircraft. These measurements will be taken by Northern Research and Engineering Personnel periodically to determine if changes in emission rates of NO(x), CO, CO(2), SO(2), particulates and free hydrocarbons occur during accumulation of time on turbine engines. Similar measurements will also be made on different model engines used by other U.S. airlines.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0020 NUMERICAL SUPERSONIC FLOW FIELD STUDIES FOR NAVAL AIRCRAFT AND MISSILES
S.I. CHENG, Princeton University, School of Engineering, *Princeton, New Jersey* 08540 (DN123180; N00014-75-C-0376)

The development of accurate methods to compute the flow fields about wings and bodies for complex flow situations is essential for the aerodynamic design of aircraft and missiles. In the proposed investigation, the flow over a yawed cone and the interaction of a shock wave with a boundary layer will be studied within the framework of the Navier-Stokes equations. The cone problem is representative of the flow over the forward portion of a maneuvering missile or aircraft and the shock wave study is representative of transonic flow on an airplane wing.

Many complex flow situations about aircraft and missiles cannot be calculated with reliability by existing theory. Developments in computer technology together with advances in numerical methodologies now make the study of these complicated flows, within the framework of the fundamental equations of motion, an extremely attractive and fruitful approach. For the cone problem, the Navier-Stokes equations will be differenced in a spherical polar coordinate stretching and studied as a means of increasing numerical accuracy. Difference procedures will be assessed and the influence of flow boundary conditions investigated. The shock wave boundary layer interaction problem will initially treat a weak shock wave and a laminar boundary layer; subsequently a phenomenological turbulent representation of the boundary layer will be included.

Supporting agency address information: Office of Naval Research, Arlington, Va 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0021, NAVY VEHICLE DESIGN AND CONSTRUCTION - TRANSONIC ANALYSIS OF TWO ELEMENT AIRFOILS
B. GROSSMAN, Grumman Corporation, *Bethpage, New York* 11714 (DN575295; N00014-75-C-0722)

At transonic speeds, where air to air combat usually occurs, the performance and maneuver capability of fighter aircraft is often limited by such adverse factors as buffeting, increased drag, and losses in lift and stability. A proven approach to overcoming these adverse factors is the use of leading edge slats and trailing edge flaps. However the reasons for the effectiveness of slats or flaps at transonic speeds are not presently well understood and development of good slat (flap) design in a wind tunnel program is extremely difficult and expensive. This research is directed toward developing a completely theoretical solution to analysis and design of transonic two-element airfoil configurations.

The approach being taken is to merge conformal mapping techniques with transonic mixed flow relaxation numerical procedures. The conformal mapping procedure maps the area outside a two-element airfoil to the annular area within two concentric circles. Numerical relaxation procedures for computing inviscid transonic flows over single airfoil configurations will be extended to treat the two-element airfoils problem by solving the full nonlinear potential flow equations in a computational plane determined by the conformal mapping of the region exterior to the two-element airfoil to the annular region between two concentric circles.

Supporting agency address information: Office of Naval Research, Arlington, Va 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0022, AFTERBURNING EMISSIONS MEASUREMENT TECHNIQUES
T. LYON, General Electric Company, *Cincinnati, Ohio* 45215 (DF455930; F33615-73-C-2047)

The proposed program will result in a recommended technique for emission measurement of afterburning engines. Details of the technique, like number of measurements, number of probe locations, probe design, etc., shall be developed. Statement of problem- recently, attention has been focused on the emission characteristics of afterburning engines. Few attempts have been made to measure afterburner emissions and no accepted technique for obtaining these data exists. A number of significant problems exist- (a) the reactive hog gas stream exiting the exhaust plane changes its chemical composition in the exhaust plume, (b) the high temperatures in the exhaust create the need for especially- designed gas sampling probes, and (c) chemical reactions are likely to occur in the probe and sampling line. These problems must be overcome if conventional emission measurement equipment is to be used in research programs which address the afterburner emission problem. This cone program only involves determination of a near-term (within the next two years) solution to the problem -- one which will probably utilize current state-of-the-art measurement equipment. Long range solutions like a remote laser-Raman measurement system are addressed in other AFAPL programs.

The program is predominately a contracted effort. Experimentally, the contractor shall be required to develop sampling techniques and conduct tests with a number of afterburning aircraft turbine engines. These efforts are intended to check various probe arrangements, data reduction schemes, etc. Analytically, the contractor shall be required to study and model the aerodynamics and reactions occurring in the exhaust plume. The model shall be used to predict true afterburner exhaust emission levels from test cell exhaust plane data.

Supporting agency address information: AF Aero-Propulsion Laboratory SFF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0023, INTERACTION OF ULTRA HIGH MACH NUMBER GAS JETS
S.L. PETRIE, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (DF213940; F33615-73-C-4012)

AF function - aerospace vehicles (hypersonic flight). Deficiency - duplication of reentry environments in ground facilities. Research - operation of fluid dynamic facilities and their subsystems for experimental aerodynamic testing at the pressures, temperatures, and velocities associated with vehicle reentry. How research contributes - to simulate true flight conditions of high speed vehicles and reentering ballistic missiles, enabling investigations of materials resistivity, wake characteristics and aero and thermomechanical phenomena.

An experimental study of wave pattern methods (selected by the contractor) for focusing ultra high velocity air and refractory particles into suitable zone configurations. The purpose is to demonstrate the feasibility of the methods for application to a full scale system. Small scale models are to be employed in the validation experiments. The contractor will investigate how focused particles varying in size from 1/2 to 10 microns in gas streams may have velocities up to 20,000 ft/sec. The focused zone configuration for the liquid or solid air particles is to be compatible for their vaporization by laser radiation and must be a stable configuration, time and space, for the production of the wind tunnel working gas. The zone configuration for the refractory particles should result in the optimum exchange of their momentum and energy to the tunnel working gas. Final separation of these particles from the working gas will be accomplished by methods such as with a Prandtl-Meyer expansion. The contractor will prform an experimental study of the flow and shock wave structure in small scale model acceleration nozzles and interacting jets by conducting Schlieren photographic studies of the interacting region of impinging gas jets (hydrogen, helium) in the range of Mach numbers from 10-20. The shock wave patterns and their strengths along with the local flow direction, velocities and pressures will be determined for the final jet interaction region of the acceleration section of the direct energy transfer system. Various impingement angles as well as alternating nozzle systems will be considered. Small scale flow models will be employed.

Supporting agency address information: Aerospace Research Laboratory LF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0024, FLIGHT CONTROL ACTUATION SYSTEMS DEVELOPMENT

G.D. JENNEY, Dynamic Controls Incorporated, *Dayton, Ohio* (DF134910; F33615-75-C-3068)

Few military aircraft currently utilize active controls due to the recent advent of this type of application. Improved aircraft performance and other advantages may be realized--however, new requirements are placed upon the actuation systems. A prime objective of this program is to improve the effectiveness of actuating systems for active controls, ultimately extending the useage of this technology.

A survey and study of existing active control actuator systems will precede a test and development effort. Prime areas for system improvement will be determined and subsequent development efforts will be accordingly concentrated. Eventual expanded military aircraft active control application and associated performance and other improvements will follow as a product of improved active control actuator system technology.

Supporting agency address information: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0025, DEVELOP AND IMPROVE DYNAMIC PRESSURE MODELS TO BE USED AS RE-ENTRY NOSE TIP CALIBRATION STANDARDS FOR THE 50 MW RENT

R.G. CAMPBELL, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF131490)

Survivability of ballistic missile nose tips and other re-entry thermal protection systems is critical to the nation's defense. Realistic flight simulations with accurate duplications of pressure are essential to the development of these systems although the measurement of pressure is technically difficult. The objective of this effort is to develop a sensing device that will give the 50 megawatt re-entry facility the capability of making accurate pressure measurements in the simulated re-entry environment.

The complete model will be designed and built in-house to accept purchased transducers. The model will optimize response time and temperature immunity, while maintaining multi-port capability necessary for accurate measurements and survival in the rent environment.

Supporting agency address information: AF Flight Dynamics Laboratory FXN, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0026, FLIGHT TEST OF CAVITY OSCILLATION MECHANISMS AND SUPPRESSION DEVICE

D.L. CARR, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF135730)

A severe vibration environment is generated by pressure fluctuations which exist in weapons bays of fighter and bomber aircraft when the bay doors are open during flight. The resulting structural response causes crew fatigue, equipment failure, and unpredictable inputs at store release resulting in potentially dangerous separation characteristics or trajectory error. The objective of this effort is to verify through flight tests the results of contractor and in-house wind tunnel tests concerning the effect on pressure amplitude of geometric changes at cavity leading and trailing edges. These results will be used to develop methods to reduce the adverse pressure fluctuations in weapons bays. Application of these methods will improve the maintainability of these aircraft and insure safe and reliable weapons release.

An RF-4C test aircraft is used to conduct flight tests on a SUU-41 munitions pod modified to contain different cavity configurations. The test configurations include modified and unmodified single and tandem cavities. Three pressure altitudes and a Mach number range from 0.6 to 1.3 are to be observed for each test configuration. The cavities are instrumented to measure fluctuating pressures, static pressures, temperatures and accelerations.

Supporting agency address information: AF Flight Dynamics Laboratory FYAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0027, HIGH PERFORMANCE ACTUATOR SYSTEMS FOR MILITARY AIRCRAFT

B.H. EARLEY, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF134630)

A majority of current military aircraft utilize actuation systems of relatively low performance. More stringent mission requirements demand an improved level of performance which may be obtained in part through the application of advanced servoactuator technology, 'active' controls and less complex, but equally effective redundant systems. The objective of this program is to develop servo-control system technology for optimum airframe/mission integration by taking full advantage of the current component state-of-the-art.

This program complements the program titled, 'Flight Control Actuation Systems Development.' A survey and study of existing active control actuator systems will precede a test and development effort. A prime area for system improvement will be more effective servo system mechanization for improved reliability, reduced weight complexity and cost. In-house participation provides the supplementation required for effective support of flight control systems development and for expansion and improvement of in-house facility capabilities.

Supporting agency address information: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0028, FUEL TANK RESPONSES TO PROJECTILE IMPACT AND FLUID SHOCK PULSES

P.F. FRY, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF131000)

Aircraft fuel tanks are particularly susceptible to catastrophic fracture and rupture due to the intense pressure pulses immediately following projectile impact. The objective of this effort is twofold--to thoroughly understand the events that cause this damage, and to develop fuel tank modifications which can inhibit or negate this damage.

A comprehensive testing program will be conducted in conjunction with a thorough analysis of each of the significant events beginning with projectile impact and continuing as long as the pressure pulses are intense enough to cause tank wall rupture or fracture. Following these investigations, models will be developed which will characterize the significant events. Finally, these models will be used to develop and refine fuel tank modifications which can reduce damage to a minimum.

Supporting agency address information: AF Flight Dynamics Laboratory PTS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0029, PREPARATION AND APPLICATION OF SIMULATED AIRCRAFT ENGINE BLEED AIR
J.B. GISCLARD, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF135010)

On-board oxygen generating systems for advanced military aircraft are expected to reduce related ground support and, thus, provide significant cost savings and improved mission flexibility. These new oxygen systems will extract oxygen from aircraft engine bleed air and, therefore, must be capable of withstanding the effects of contaminants that may be present in this bleed air. This effort will investigate the nature of such contaminants and develop a capability for preparing simulated mixtures for test purposes. Simulation will provide greater control and repeatability of test conditions than the use of actual aircraft engines for such test and will provide a much cheaper means of system evaluation.

Data from prior bleed air analyses efforts plus that from other sources will be examined to establish those contaminants that exist in sufficient quantity to pose potential difficulties to oxygen generating systems. Techniques for making and controlling representative mixtures of these contaminants will be developed by exploring gas ratioing, permeation tubes, and various other means of gas and vapor generation.

Supporting agency address information: AF Flight Dynamics Laboratory FEE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0030, APPLICATION STUDY FOR THE TACTILE INFORMATION PRESENTATION (TIP) WARNING DEVICE
B.R. HATTERSHIRE, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF134930)

The vastly increased complexity of modern high performance aircraft places great information processing workloads on the visual and auditory senses of the pilot. The objective of this effort is to refine, improve, install, and evaluate a tactile warning device which will open the tactile sense as a meaningful, pilot-acceptable information channel.

The basic device (an air-pulsed bladder) already exists. information obtained from previous TIP work will be combined with data from pilot questionnaires to determine alternate warning functions and bladder locations. Equipment will be improved and modified, and centrifuge tests will be run to determine the most effective stimulus level and position for the device under a variety of g loads. Modified equipment will be installed in a test aircraft to objectively and subjectively measure utility of the device in an operational environment.

Supporting agency address information: AF Flight Dynamics Laboratory FGR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0031, MILITARY AIRCRAFT DESIGN METHODOLOGY
S.J. KOOB, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF129020)

In support of the laboratory's aircraft design activities, mathematical and computational methods, incorporating man in the loop where appropriate, are needed for the rapid and accurate definition, analysis, design, and evaluation of flight vehicle systems. Vehicle preliminary design analysis will be achieved primarily by collecting and integrating a variety of methods, programs, and computer graphics hardware into a faster, more accurate, and interactive design synthesis computer program. These techniques will be sufficiently developed to analyze a complete flight vehicle design for a specified mission within a few days, requiring several weeks. The ultimate objective is to make high speed computing power readily and easily accessible to the designer without requiring him to be familiar with the details of programming and computer hardware.

The approach is to develop and acquire the graphics software and hardware required for a designer to communicate with a large design/analysis program (CASP) via a local graphics console to define the vehicle mission and geometry. Existing, more accurate, aerodynamics and mission analysis modules will be modified for inclusion in the CASP program. Methodology for assessing the impact of emerging technologies will be required and incorporated into the CASP program.

Supporting agency address information: AF Flight Dynamics Laboratory PTB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0032, TRANSONIC AIRFOIL FLUTTER ANALYSIS
J.J. OLSEN, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF132740)

High speed military aircraft require extensive transonic wind tunnel testing to verify flutter flight-safety. That testing is necessary because transonic unsteady aerodynamic prediction methods have been unavailable for flutter analyses. However, new developments under work units 13700113, 13700402, 19290501, 19290502, 19290503, and 19290504 are resulting in the necessary transonic aerodynamic prediction methods. The purpose of this effort is to improve those methods and/or incorporate them into an AFFDL capability for transonic flutter analysis. Cost savings will occur because the demonstration of the new aerodynamic methods in a flutter analysis will increase the confidence of the aerospace community in their use. Their confident use will result in a reduced dependence on expensive transonic wind tunnel testing to evaluate flight-safety. Military aircraft will then be subject to parametric optimization of their design for the most efficient transonic flight.

The equations of motion for two dimensional airfoils will be written to allow the nonlinear time-dependent forces of transonic flight. Methods will be developed to examine the stability of the airfoils in transonic flow. Improvements in speed and accuracy will also be sought for the unsteady aerodynamic methods developed by contractors such as recent in-house developments which reduced finite-difference computing times by an order of magnitude.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0033, ADVANCED TRANSONIC WIND TUNNEL WALL INTERFERENCE REDUCTION
T.M. WEEKS, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF135690)

Reliable ground simulation of forces and moments acting on high performance fighter aircraft in high lift maneuvering conditions significantly reduces acquisition costs of these aircraft. The technological deficiency of present day wind tunnels to provide results fully free of wall interference can be eliminated through the use of walls having adaptive control as demonstrated for a particular two- dimensional case. Extension to more complex flows and configurations is needed to expand the boundaries of interference free simulation resulting in reduced time and cost of acquisition.

Testing will be conducted on biconvex airfoils, advanced technology airfoils, and wing/body configurations in high Reynolds number facilities, adaptive wall facilities and the AFFDL TGF. Based on midfield flow measurement technology proven within FDL, pressure, flow angle, and wall crossflow detail data will be taken. Analytically, the adaptive wall control concept and its limitations relative to midfield measurements will be established resulting in improved wall crossflow characteristics and consequently more accurate boundary conditions. The effort will be fully coordinated with other Air Force elements as well as with NASA, USN, and industry.

Supporting agency address information: AF Flight Dynamics Laboratory FX, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0034, MOBILE EMISSIONS LABORATORY BUILDUP
D.L. DAVIDSON, Aro Incorporated, *Tullahoma, Tennessee* 37389 (DF420828; F40600-74-C-0001)

The work on this project is to provide the Air Force Aero-Propulsion Lab /AFAPL/ an exhaust emission system to be installed in an AFAPL-supplied van. The system is to be capable of measuring CO, CO2, NO, NO2, NOx and smoke at the nozzle exit of typical AF turbojet engines.

The first work is to design and procure components for the system and, if craft personnel are available, begin fabrication of the system and adaptation of the AFAPL van.

Supporting agency address information: Arnold Engr Dev Center, Arnold AFS, Tn 37389

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0035, TETHERED BALLOON WINCH MODIFICATION
K.J. TURNER, Otis Engineering Corporation, *Dallas, Texas* 75234 (DF243020; F19628-75-C-0095)

AF function - advanced balloon systems (surveillance, reconnaissance, communications, environmental research support, space equipment tests, delivery operations). Deficiency - inability of tethered balloon winch (1) to reel cable for long periods of time without overheating and (2) to accept a small diameter cable of lengths up to 70,000 feet. Objective - improve the ability of an AFCRL winch to handle very long cable lengths at high speeds at high temperatures by increasing the cooling of its hydraulic fluid and revisions to various mechanical elements. How research contributes - research aids in achieving higher altitudes with scientific and operational payloads for long duration and economic evaluation testing of military weapons systems. Improvements in balloon system components increase system performance in areas of altitude, stability, payload weight or duration.

In order to accommodate the excessive heat developed from long lengths of cable at maximum speed, hydraulic fluid will be made to flow through a newly designed heat exchanger. The heat exchanger will be placed in line with the engine radiator and be governed by a thermostat. The level-wind system must also be modified to uniformly reel the proposed small diameter Kevlar cable. Various seals and other parts will be replaced to accommodate the higher pressures to which the winch will be subjected. A set of new shoes must also be fabricated for the capstan and sheaves for the rope size being considered.

Supporting agency address information: AF Cambridge Research Laboratories LC, L. G. Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0036, TORSION FREE WING TREND FLUTTER MODEL PROGRAM
A. MURPHY, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF134510; F33615-75-C-3045)

The broad problem is the need for a technology assessment of the torsion free wing. This assessment will reduce the risk for application to tactical aircraft. The technical objective is a flutter model test that will indicate the validity of the design concepts and analysis tools. The use of the torsion free wing would enhance precision piloting tasks such as weapons delivery.

Several flutter models of representative torsion free wing configurations will be designed and fabricated for low speed testing. The models will be designed for a specific flutter speed, and will be instrumented to measure the appropriate parameters. At the completion of the tests, the theoretical calculations will be compared to the measured values. Problems with model fabrication could delay this effort.

Supporting agency address information: AF Flight Dynamics Laboratory PTC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0037, F-111 WIND TUNNEL MODEL
J. SLICKER, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF634720; F08635-74-C-0113)

To design and fabricate an F-111 wind tunnel model for weapons interface testing. The model will be compatible with the AEDC four-foot transonic and the tunnel 'A' supersonic wind tunnels. The model will be used for store separation, installed carriage loads and aerodynamic heating tests.

It is anticipated that this will be a sole-source procurement with General Dynamics Fort Worth for the design and fabrication of the model.

Supporting agency address information: AF Armament Laboratory DLJA, Eglin AFB, Fla 32542

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0038, ENGINEERING SUPPORT FOR THE MODULAR AIR TRANSPORTABLE HOSPITAL (MATH)
G. FROMME, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF319500)

To provide engineering support to the bare base SPO on the modular air transportable hospital.

Monitor system acquisition, provide technical support for preparation of technical operation and maintenance manuals for system users, assist in identifying and eliminating operational deficiencies.

Supporting agency address information: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0039, CALCULATION OF DYNAMIC AERODYNAMIC DERIVATIVES ON GUIDED AND UNGUIDED PROJECTILES
F.G. MOORE, U.S. Navy, Weapons Laboratory, *Dahlgren, Virginia* 22448 (DN484020)

The objective of the present research is to calculate dynamic derivatives (pitch damping, roll damping, and magnus) on guided and unguided projectiles.

Available analytical and empirical procedures will be utilized to the fullest extent to calculate the dynamic derivatives. It is believed that reasonable solutions can be obtained for finned configurations using the above methods. For the body alone, indications are that roll damping and pitch damping can be estimated empirically. However, available empirical methods do not give good results for magnus as a function of body shape. The two main body shape variables in magnus are total length and boattail shape. The length variation has been accounted for previously and it is proposed that the boattail variation be found from a systematic wind tunnel study.

Supporting agency address information: Naval Ordnance Systems Command 035A, Washington, D.C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0040, HT PP 74-51- MINI REMOTELY PILOTED VEHICLES (RPV) PROPULSION
E.H. DEAN, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3977)

The technical objective is to conduct exploratory development of propulsion systems for remotely piloted vehicles (RPV). Effort will encompass the complete RPV propulsion system, including individual components (engines, propellers, etc.) and propulsion system installation investigations. Design, fabrication, and validation testing of engines, engine components, and other propulsion system components will be conducted.

The approach will be: identify and catalogue potential RPV propulsion systems in the 1-50 hp class, identify propulsion problems encountered with previous mini-RPV programs, formulate and initiate an exploratory development program with the objective of providing a reliable RPV propulsion system, conduct investigations leading to validation and selection of potential mini-RPV propulsion systems, and formulate test programs geared towards validating propulsion system performance.

Supporting agency address information: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0041, HT RM 75-28- ADVANCED TECHNOLOGY HELICOPTER EXTERNAL CARGO SLINGS
S. HOLA, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3978)

To advance the technology of helicopter external cargo slings to reduce weight, increase flexibility and improve handling qualities.

Perform a survey to determine the most promising of newly developed materials (such as Kevlar PRD 29). Investigate various material construction techniques and end fitting attachment methods. Perform tensile, fatigue, vibratory and environmental tests on selected material specimens by utilizing other govern-

ment agencies, e.g. Nat. Bureau of Stds, and AMMRC. Deliver a quantity of sling legs, compatible with existing attachment hardware, to the government for flight testing.

Supporting agency address information: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0042, HT 74-14- BALLISTIC TESTING, ARMY AIRCREW AND CRITICAL COMPONENT PROTECTIVE DEVICES
C.M. PEDRIANI, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3912)

To provide ballistic testing of critical component and aircrew protective devices and to validate design criteria that increase the ballistic survivability of Army aircraft.

To conduct experimental firing programs in conjunction with design, fabrication, and ballistic test to evaluate- 1) fuel fog inerting concepts to reduce inflight fuel fires in helicopter- 2) fuel tank materials to increase the survivability of the AH-1G to 14.5mm API projectiles- 3) fuel tank materials to increase the survivability of the AH-1G to 23mm HEI projectiles- 4) ballistic tolerant drive shafts/aircrew transparent and opaque armor upgrade- 5) support of other area missions, e.g., aircraft structures and flight controls- 6) miscellaneous support, e.g., installation, test, and evaluation of UTTAS and HLH.

Supporting agency address information: AVCOM Eustis Directorate, US Army Air Mobility R&D Lab, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0043, HT RM 74-19- DESIGN, FABRICATE, INSTALL IMPROVEMENTS/MODIFICATIONS TO HELICOPTER TRANSPORTED CONTAINER HANDLING DEVICE
S.G. RIGGS, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3937)

The purpose of the container handling device is acquiring (alignment with and latching onto), transporting, and delivering 8feetx8feetx20feet standard cargo containers as external payload by cargo type helicopters. Limited flight testing has been completed. It is the objective of this task to design and install improvements/modifications to provide a more effective, reliable device.

Perform a study/analysis of flight test results and evaluate recommendations/observations made by test pilots and technical personnel. Inspect device for wear/damage, subsystem response, side/end guide configurations, microswitch positioning, etc. Design, fabricate, and install appropriate modifications/improvements on the device. Flight tests will be scheduled with operational units as feasible. Monthly check-out and maintenance will be performed to assure operational readiness.

Supporting agency address information: AVCOM Eustis Directorate, Air Mobility R&D Lab, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0044, HT MA 74-6- UTILITY HELICOPTER RELIABILITY AND MAINTAINABILITY (R M) ANALYSIS
L. WALKERMR, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3895)

The objective of this effort is to develop two R&M simulation analysis techniques directed toward utility helicopters in general, and the UTTAS in particular. Technique I will permit aircraft system-level measurements when subsystem/component inherent R&M characteristics are specified. Technique II will permit system-level measurements when simulating within specified constraints (e.g., parts, maintenance personnel, and delay times).

Transform an existing UH-1N R&M simulation model into the necessary form for describing the UTTAS operational and maintenance environment. Sensitivity analysis will be performed using UH-1N data for selected parameters that exhibit uncertainty. Subsequent testing will be performed using T-700 engine and UTTAS data.

Supporting agency address information: AMC Eustis Directorate, Air Mobility Research and Development Laboratory, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, NONELECTRIC FIRING SYSTEMS (IED)
A.O. SMITH, U.S. Navy, Propulsion Development Dept., *Ridgecrest, California* 93555 (DN482097)

Design, fabricate and demonstrate a system to safely ignite solid propellant rocket motors without the use of electrical leads or electroexplosive devices.

The electroexplosive device (EED) will be replaced by a device containing no bridgewires, electrical leads, or sensitive primary mixtures. This device will be initiated by a pulse of energy from a remote source. At least two alternate types of transmissible power are available (pneumatic and high energy light) as alternates to electricity. The various initiators and power sources will be tested and evaluated as to reliability, safety, cost and physical design constraints. A system will be selected and demonstrated which can eliminate all inadvertent initiations prior to connection with a launch system firing circuit.

Supporting agency address information: Naval Weapons Center (01), China Lake, California 93555

SUPPORTED BY U.S. Dept. of Defense - Navy

2.0002, ELECTRONICS EDUCATION MODULE ON SATELLITE COMMUNICATIONS
M. DAVIDOFF, Catonsville Community College, Undergraduate School, *Baltimore, Maryland* 21228 (HES75-17333)

This project is designed for the development of a self-contained educational module on satellite communications for electronics technology students and instructors. This educational objective will be met by producing a module consisting of a student laboratory manual employing 'hands on' experiments and 'real time' involvement with a recently launched satellite and an accompanying reference manual for instructors. When completed, the module may be utilized either by incorporating it into existing courses in electronics or physics, or by presenting it as a separate mini-course for employed technicians who wish to upgrade their skills in this area.

SUPPORTED BY U.S. Natl. Science Foundation

2.0003, ELECTRICAL INJECTION SIMULATION OF SGEMP ON SKYNET
J. ROSADO, U.S. Army, Harry Diamond Laboratories, *Hyattsville, Maryland* 20783 (DA0E5804)

The objective of this program is to perform a set of electrical current injection experiments on the Skynet satellite and compare the results with analytical predictions. The experiments will be designed to simulate various aspects of the system-generated electromagnetic pulse (SGEMP) on a satellite structure complete with interface circuits (passive).

A set of analytical predictions was generated to relate the electrical pulse injection to the photon illumination SGEMP problem. Basically structural and surface currents have been predicted for a set of specified external current injection methods. The major portion of this program is devoted to performing a meaningful current injection experiment on Skynet and to measure the response of the satellite.

Supporting agency address information: AMC Harry Diamond Laboratories, AMXDO-RBI, 2800 Powder Mill Road, Adelphi, Md 20783

SUPPORTED BY U.S. Dept. of Defense - Army

2.0004, SECOND-ORDER SUBOPTIMAL CONTROL
D.G. HULL, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: The optimal control problem is reformulated as a parameter optimization problem by assuming a mathematical form for the control which contains a number of unknown constants (Ritz procedure). A second-order parameter optimization program has been written and is being used to determine the unknown constants and, hence,the suboptimal control. The maximum cross-range reentry problem is being used as a test case.

SUPPORTED BY University of Texas

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, DEVELOPMENT OF HIGH TOUGHNESS TITANIUM ALLOYS
J.C. WILLIAMS, Rockwell International Corp., *Los Angeles, California* 90009 (DN330020; N00019-73-C-0335)

To develop a titanium alloy with high yield strength and greatly improved fracture toughness (KIC) for naval aircraft structural applications.

Conduct analysis of twenty compositions in combination with processing variations. Two strength levels were sought; 135 KSI ultimate with KIC of 100 KSIVIN and 170 KSI ultimate with 80 KSIVIN.

Supporting agency address information: Naval Air Systems Command 52031D, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0002, DEVELOPMENT OF HIGH TOUGHNESS TITANIUM ALLOYS FOR AIRCRAFT STRUCTURES
J.C. WILLIAMS, Rockwell International Corp., *Los Angeles, California* 90009 (DN590026; N00019-75-C-0208)

To develop two titanium alloy compositions with minimum 135 KSI tensile strength and 100 KSI VIN fracture toughness and minimum 170 KSI tensile strength with 80 KSI VIN fracture toughness for naval aircraft structural applications.

Conduct analysis for twenty compositions varying Mo, Al, Cr, Zr, and V in combination with process conditions. Upscale process using optimum parameters.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0003, TRANSFORMATION-INDUCTED PLASTICITY IN NAVAL AIRCRAFT TITANIUM ALLOYS
R.L. JONES, Stanford Research Institute, *Menlo Park, California* 94025 (DN930030; N00019-72-C-0201)

To determine whether thermomechanical processing concepts developed for trip steels may be adapted for improved strength and/or ductility in titanium alloys needed for naval aircraft structural applications.

Formulation of compositions of complex titanium alloys having controlled NS and MD temperatures and beta stability. Experimental procedures will include rolling of the alloys in the beta condition at approximately 400 to 550C, followed by quenching to sub-zero temperatures. Tensile properties, hardness measurements, metallographic, acoustic, and electron microscopic studies will evaluate these compositions and thermomechanical treatments.

Supporting agency address information: Naval Air Systems Command 52031E, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0004, CORRELATION OF MICROSTRUCTURE WITH FRACTURE TOUGHNESS PROPERTIES IN TITANIUM ALLOYS
F.A. CROSSLEY, Lockheed Aircraft Corporation, *Palo Alto, California* 94304 (DN230057; N00019-74-C-0161)

To establish a basis for predicting fracture toughness of metals by correlating microstructure with fracture toughness.

Four conditions of Ti6Al-4V will be studied, i.e. alpha segregation, and three processing defects--Ti3Al, oxygen and hydrogen contamination. Three basic types of microstructure for Ti6Al-6V-2Sn will also be studied.

Supporting agency address information: Naval Air Systems Command 52031D, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0005, NAVY VEHICLE DESIGN AND CONSTRUCTION-FUNDAMENTALS OF PLASMA-ARC WELDING
C. SHAW, Rockwell International Corp., *Thousand Oaks, California* 91360 (DN575279; N00014-75-C-0789)

This research is on the plasma-arc welding technique to optimize variables in the process. The research has direct relevance to hydrofoil and surface-effect ship fabrication.

The plasma-arc process will be investigated to optimize various parameters controlling the final weld quality. The temperature distribution in the standoff region will be measured as a function of weld variables. Temperature distribution will be correlated with weld penetration and quality in 1/2-inch titanium 6-4 alloy. The plasma will be characterized with respect to the ionized metal vapor.

Supporting agency address information: Office of Naval Research, Arlington, Va 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0006, EQUILIBRIUM PHASE RELATIONS IN HEAT RESISTING ALLOYS
J.B. NEWKIRK, Univ. of Denver, School of Engineering, *Denver, Colorado* 80210 (GH-40446)

This project consists of the following two parts: 1. Clarification of parts of the Co-Cr equilibrium phase diagram. Two equilibrium phases in the Co-Cr system are in doubt, viz. (1) the so-called delta phase (B.C.C.), which is said to extend from about 40 to about 70 at per cent Or, and from about 1300 degrees C to the solidus, and (2) a proposed high temperature F.C.C. allotrope of pure chromium. Alloys in the composition ranges involved will be made by tungsten arc melting under argon. They will be crystallographically and metallographically examined by light microscopy, electron probe microanalysis, scanning electron microscopy and X-ray diffraction after equilibrating at high temperature and then quenching to room temperature. High temperature Debye-Scherrer photograms will be made to test for the existence of the two equilibrium phases in question at elevated temperatures. 2. Chemical analysis of minor phases in nickel-base alloys. The feasibility of electrolytically dissolving only one phase from a powder mixture of several phases has already been shown. This electrolytic method will be further developed, using a potentiostatically controlled cell designed to hold powder particles in anodic relation with respect to an inert (Pt) cathode. Polarization curves for common intermetallic phases will be established, using electrolytes, selected to give wide separations between rest potentials for the various phases. Attempts will then be made to define experimental conditions for the most efficient selective dissolution of one phase at a time from the powder mixture. After each phase has been dissolved, its chemical composition will be determined by atomic absorption analysis of the electrolyte. The method will then be applied to the selective dissolution of the common minor phases occurring in nickel-base superalloys.

SUPPORTED BY U.S. Natl. Science Foundation

3.0007, NAVY VEHICLE DESIGN AND CONSTRUCTION-LASER WELDING OF METALS AND ALLOYS
E.M. BREINAN, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN475434; N00014-74-C-0423)

The development of new welding processes is important to the effective use of higher strength metal alloys in naval components. Laser welding is a welding process of great potential whose characteristics have not yet been examined in detail. This investigator will determine the influence of varying many parameters of laser welding on a wide range of metal alloys.

Effects of the laser operating mode, optical parameters, power density, and shielding gas will be determined with respect to welding performance using a carbon dioxide laser. Plasma formation above the weld will be examined with the aim of eliminating its detrimental effects on depth of penetration. A series of metals will be laser welded to develop improved understanding governing energy input to the metals relative to their physical properties. High strength structural steel (130,000 psi yield) will be laser-welded and extensive mechanical testing performed on the welded specimens.

Supporting agency address information: Office of Naval Research 471, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0008, DEVELOPMENT OF DIRECTIONALLY SOLIDIFIED EUTECTIC NICKEL AND COBALT ALLOYS

E.H. KRAFT, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN590014; N62269-75-C-0129)

To develop directionally solidified eutectic nickel and cobalt alloys for service at 2000 F and above.

Alloys based on the gamma-alpha system - (Ni, Al)-(Cr, W) and (Ni, Al)-(Cr, Mo); and the (Co, Cr)-(Cr, Co) 7 C3 system are being optimized in the nickel base system, emphasis is placed on factors influencing directility. In the cobalt system, emphasis is placed on factors influencing resistance to thermal cycling.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0009, EXPERIMENTAL PROGRAM TO ESTABLISH THE RELATIONSHIP OF KRYPTON EXPOSURE INDICATIONS AND MICRO DEFECTS

F. VICKI, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN230059; N00019-72-C-0518)

Investigate relationship of krypton exposure indications and micro defects which can grow under high load cyclic conditions and result in rapid failure of critical metallic components.

LCF fatigue tests will be conducted on specimens of: Ti-6-4, Ti-6- 2-4-2; steels, AMS 6304 and D6AC; aluminum, 2024-T3; nickel base, INCO 901 and Waspalloy. The relationship between krypton exposure indications and micro defects and cracks initiated thereby will be investigated.

Supporting agency address information: Naval Air Systems Command 52031C, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0010, WEAPONRY - STRESS AND STRAIN MEASUREMENT IN SOLID PROPELLANTS AND OTHER NAVAL STRUCTURES

A.J. DURELLI, Catholic University of America, School of Engineering, *Washington, District of Columbia* 20017 (DN523496; N00014-75-C-0663)

The objectives of this research program are to develop advanced photoelastic laser techniques and experimental stress methods for complex structural systems. The developments in dynamic photoelasticity and holography have important applications in the design of structures able to withstand earthquakes and shocks. The gravitational studies have application in the design of high acceleration rockets and in the design of dams. The studies conducted on composite materials can be applied to the design of rocket motor cases, as well as to the design of reinforced rocket fuel.

Research currently underway: it has been shown in an analysis of the Fraunhofer diffraction pattern of two superposed gratings by the methods of fourier optics that the different moire patterns can be separately observed by spatial-filtering techniques. Examples of additive and subtractive moire patterns obtained individually over the whole field of two superposed gratings have been presented. Using this method the whole field of Cartesian shears and rigid rotations has been experimentally obtained. The method has been applied to a circular ring subjected to diametral compression.

Supporting agency address information: Office of Naval Research, Arlington, Va 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0011, NAVY VEHICLE AND MATERIAL SUPPLY TECHNOLOGY - MECHANISMS OF CRACKING IN HIGH STRENGTH ALLOYS

C.D. BEACHEM, U.S. Navy, Research Laboratory, *Washington, District of Columbia* 20390 (DN220026)

Cracking and failure mechanisms of alloys which are either in - service or are candidates for in-service aircraft weapons systems are studied via electron fractography in order to better understand these mechanisms and alleviate the problems.

Crack initiation and fracture processes are dependent upon the stress, environment, and microstructures local to the crack tip. Titanium, steel, and aluminum alloys are studied in both laboratory specimens and in service-failed components in order to both carefully control crack tip conditions and to compare these laboratory studies to those from the specialized laboratory of service conditions.

Supporting agency address information: Naval Air Systems Command, Material Acquisition, Engrg. Div. (AIR-52031), Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0012, THE EFFECT OF MICROSTRUCTURAL FEATURES ON THE RESPONSE OF ALUMINUM ALLOYS TO CYCLIC DEFORMATION

E.A. STARKE, Georgia Inst. of Technology, School of Chemical Engineering, *Atlanta, Georgia* 30332 (DF037750; AF-AFOSR-2615-74)

The longevity, reliability and safety of aerospace structures are related to the fatigue properties of the structural materials used. In fact, the fatigue properties of structural materials often limit their application. Thus, it is important to understand the mechanism of fatigue and especially the metallurgical means by which fatigue resistance may be improved. The objective of this research is to determine the effects of microstructural features on cyclic deformation modes, in particular to clarify certain ambiguities concerning cyclic softening behavior of age-hardened aluminum alloys, and to distinguish those features which cause the low fatigue stress/tensile strength ratio inherent in these materials. Since aluminum alloys form a major portion of the material currently used for skin and other structural airframe applications, it is appropriate that they are the basis of this investigation. The broader fundamental understanding of the fatigue behavior of aluminum alloys to be developed during the course of this research will provide the basis for carrying out future alloy and process development to achieve improved materials. In addition, the principles developed during the course of this investigation should also be applicable to other age-hardening systems.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0013, FRACTURING CHARACTERISTICS OF ADHESIVE JOINTS

S. MOSTOVOY, Materials Research Lab. Inc., *Glenwood, Illinois* 60425 (DN590030; N00019-75-C-0271)

To identify and quantify fabrication, environment, and use variables controlling fracture of adhesively bonded structures so stronger and more reliable aircraft and missile structures can be made.

Fracture mechanics techniques are being applied to bonded structures. Variables being investigated included adherent surface preparation, adhesive composition and post cure cycle, bond thickness, load rate, temperature, crack velocity, humidity, etc.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0014, ALLOYS OF TRANSITION METALS

P.A. BECK, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DMR73-07547 A02)

It is the purpose of this investigation to enhance our understanding of the complex magnetic behavior of well-characterized mictomagnets (i.e., alloys with permanent moments frozen in their orientations at low temperatures, but lacking long-range magnetic order). Among the alloys to be investigated are partially ordered Pd3 Mn, Rh-Fe, Cr-Fe and Cr-Fe-Al. The magnetic properties of dilute Cu-Co, and Au-Cr alloys will also be studied, both of which have been reported to be antiferromagnetic on the basis of maxima found in the susceptibility versus temperature curves, but are suspected to be mictomagnetic. The occurrence of magnetic clusters in all the above alloys and the magnetization versus field isotherms investigated to determine the giant moment and the concentration of the magnetic clusters. Furthermore, the magnetic properties of Cu-Fe alloys will be reinvestigated to clarify the relative roles of Kondo effect on the one hand and of mictomagnetism on the other. Lastly, a detailed report including extensive state of the art coverage and a review of important but as yet unresolved problems will be prepared.

This is the second year of a three year continuation grant--GH- 37568X.

SUPPORTED BY U.S. Natl. Science Foundation

3.0015, RANDOM VISCOELASTIC MATERIAL EFFECTS
H.H. HILTON, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

A theoretical investigation into the effects of statistical distributions in viscoelastic creep and relaxation functions on the state of stress and strain has been undertaken. The results indicate the possibility of predicting the probability of occurrence of stress and strain levels in time based on experimentally determined real material property distributions.

SUPPORTED BY University of Illinois

3.0016, NAVY VEHICLE DESIGN AND CONSTRUCTION - THE DUCTILE-BRITTLE FRACTURE TRANSITION IN BODY-CENTERED CUBIC AND HEXAGONAL CLOSE-PACKED METALS
R.W. ARMSTRONG, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (DN023012; N00014-67-A-0239-0011)

The goal of this research is to develop a quantitative theory that will allow the prediction of the temperature below which certain steels and other structural alloys used by the Navy can fail by fracture in a brittle manner when overstressed.

Measurements will be made of the tensile brittle fracture stress of various steels and titanium alloys as a function of grain size, strain rate, and temperatures. These experiments will be conducted over a wide enough range of conditions to provide data needed to quantify a brittle fracture theory previously developed by the principal investigator. Theoretically, an investigation will be conducted to improve the several dislocation models which have been proposed for crack formation and growth.

Supporting agency address information: Office of Naval Research 471, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0017, DEVELOPMENT OF HIGH VOLUMETRIC IMPULSE PROPELLANT FOR VOLUME LIMITED MISSILES
R.C. GILL, U.S. Navy, Propellant Science Department, *Silver Spring, Maryland* 20910 (DN485218)

To develop a family of propellants capable of delivering high volumetric impulse, up to 20 lbs-sec/cu.in. for volume limited missile systems.

Various high density ingredients will be incorporated into composite castable compositions. These formulations will be evaluated for burning characteristics, specific impulse, hazards classification, etc.

Supporting agency address information: Naval Ordnance Systems Command ORD-0331B, Washington 25, D. C. 20376

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0018, OBSCURATION EFFECTS
N. SHEETZ, U.S. Navy, Ballistics Department, *Silver Spring, Maryland* 20910 (DN485356)

To define the effect of multiple impacts on the erosion characteristics of re-entry materials.

A reanalysis will be made of existing erosion data to identify the major parameters which control the effect of obscuration on the erosion characteristics of re-entry materials. This analysis will be used to define a series of discrete particle and multiple-impact tests. A microscopic analysis will be made of the damage obtained in the discrete particle impact tests to define a region of influence for each impact. The relation of this region to the onset of multiple-impact conditions, or the critical obscuration, will be determined. Typical re-entry trajectories will be studied for various erosion fields to determine where discrete-impact and multiple-impact analyses apply. Finally, an erosion prediction code which considers obscuration effects will be developed.

Supporting agency address information: Naval Ordnance Systems Command, Dept of the Navy (ORD-035), Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0019, DEVELOPMENT OF PIEZOELECTRIC POLYMERS FOR AIRCRAFT MONITORING DEVICES
R.J. SHUFORD, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4722)

To develop high temperature piezoelectric polymers for application as on-condition monitoring devices to monitor stress and vibratory levels in aircraft systems operating in temperature ranges of minus 40 degrees C to plus 200 degrees C. To prepare and characterize highly active piezoelectric polymer films through optimization of processing variables, and to achieve a better understanding of piezoelectric behavior in polymers.

Piezoelectric polymer films will be prepared from commercially available homopolymer and copolymer films by various stretching and high voltage poling processes and then will be characterized by determining the piezoelectric response, sonic modulus, dielectric properties, and other pertinent parameters. Preparation and characterization will also be done for high temperature piezoelectric polymer films obtained from in-house or contractual synthesis of high temperature polymers having a glass transition greater than 200 degrees C. Simple monitoring devices made from these films will be attached to model structures and subjected to mechanical loading to determine the potential applicability of these devices to a variety of simulated service conditions.

Supporting agency address information: AMC Materials and Mechanics Rsch Ctr, ATTN-AMXMR-RD, Watertown, Ms. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0020, FRETTING FATIGUE AND CORROSION FATIGUE OF METALLIC MATERIALS 12626-MS
D.W. HOEPPNER, Univ. of Missouri, Graduate School, *Columbia, Missouri* 65202 (DA0F5577; DAHC04-75-G-0127)

To discover the fundamental mechanisms of fretting fatigue and corrosion fatigue in single crystals or iron, nickel, and aluminum under various fretting and corrosion conditions. Relevance - failures due to fretting corrosion, corrosion fatigue, and complicated combinations of these have been encountered in components of Army helicopters and engines. The proposed research is directly relevant to such phenomena.

The environments to be examined in corrosion-fatigue and in fretting-corrosion-fatigue include, but will not be restricted to, both gaseous and aqueous media. Other variables to be examined are crystallographic orientation, applied cyclic stress, applied normal load and the material of the fretting couple. The nature of the physical and chemical processes involved in fretting fatigue and corrosion fatigue will be elucidated in order to be able to model the behavior of polycrystals of the same materials under similar conditions. Of special interest are determinations of the kinetics of the failure mechanisms involved.

Supporting agency address information: AMC Army Research Office, Box CM, Duke Station, Durham, N. C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0021, DEVELOPMENT OF HIGHER-QUALITY AND IMPROVED-PERFORMANCE MAGNESIUM AND ALUMINUM ALLOYS - SOLDERING RESEARCH

A.E. SCHWANEKE, U.S. Dept. of the Interior, Bureau of Mines, *Rolla, Missouri* 65401 (9371-4A)

Objective: To devise effective soldering systems for joining aluminum and aluminum alloys and develop superplastic magnesium alloys having superior-performance characteristics, thereby increasing the potential use of these abundant metals.

A. Investigate soldering system suitable for joining aluminum and aluminum alloys at temperatures between 200 degrees and 350 degrees C. Investigate use of brush-plated substrates for sealing interface edges. Continue work on developing a proper fluxing system. Also, continue development of special alloys to prevent interfacial corrosion. Periodically assess the applicability of zinc-base soldering system for joining copper and copper alloys.

SUPPORTED BY U.S. Dept. of Interior - Bureau of Mines

3.0022, DEVELOPMENT OF HIGHER-QUALITY AND IMPROVED-PERFORMANCE MAGNESIUM AND ALUMINUM ALLOYS & IMPROVED-PERFORMANCE MAGNESIUM ALLOYS

M.M. TILMAN, U.S. Dept. of the Interior, Bureau of Mines, *Rolla, Missouri* 65401 (9371-48)

Objective: To devise effective soldering systems for joining aluminum and aluminum alloys and develop superplastic magnesium alloys having superior-performance characteristics, thereby increasing the potential use of these abundant metals.

Conclude effort on development of corrosion-resistant magnesium alloys. Initiate work on developing selected superplastic magnesium alloys, such as Mg-6 Zn-0.5 Zr, and Mg-32 Al. Determine compositional limits, deformation temperatures, and strain rates to evaluate their potential as commercial alloys. Concurrently, investigate superplasticity in commercially available magnesium alloys and define limiting conditions and effects of properties.

SUPPORTED BY U.S. Dept. of Interior - Bureau of Mines

3.0023, RARE-EARTH COMPOUNDS, METALS, AND ALLOYS (EVALUATION OF RARE-EARTH COBALT ALLOYS FOR USE IN PERMANENT MAGNETS)

J.W. WALKIEWICZ, U.S. Dept. of the Interior, Bureau of Mines, *Reno, Nevada* 89505 (9369-1.B)

Purpose: To investigate the utilization of rare earth-cobalt alloys as permanent magnets and correlate the effects of composition, microstructure, particle size, thermal history, and density with magnetic properties and magnetic stability. The magnetic properties of praseodymium cobalt alloys and mischmetal cobalt alloys are presently being evaluated.

SUPPORTED BY U.S. Dept. of Interior - Bureau of Mines

3.0024, NAVY VEHICLE DESIGN AND CONSTRUCTION-FLOW AND FATIGUE FRACTURE OF TITANIUM ALLOYS

H. MARGOLIN, Polytechnic Inst. of New York, Graduate School, *Brooklyn, New York* 11201 (DN575245; N00014-75-C-0793)

This research effort will be on the deformation behavior and fatigue fracture of alpha-beta titanium alloys. It will develop greater understanding of microstructural effects in this important class of alloys used in naval structures and jet engines.

The yield and flow behavior of alpha-beta titanium will be examined in a series of Ti-Mn alloys with Mn adjusted to provide 1 to 100 percent beta. Alpha morphology and distribution will be varied and the associated effects on flow behavior noted. Low-cycle fatigue behavior of Ti 6-2-4-6 will be investigated for two strength levels at different sizes of equiaxed alpha and Widmanstatten alpha. Initiation, crack growth and crack path will be determined.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0025, NAVY VEHICLE DESIGN AND CONSTRUCTION-STRENGTHENING OF TITANIUM AND ZIRCONIUM ALLOYS BY HEAT TREATMENT

S.L. SASS, Cornell University, School of Engineering, *Ithaca, New York* 14850 (DN923318; N00014-67-A-0077-0012)

Titanium and zirconium alloys are used in Navy structures because of their high strength-to-weight ratios and corrosion resistance. Precipitation hardening is a chief method for strengthening these alloys. In this project an effort is underway to better understand the precipitation mechanisms occurring in a variety of titanium and zirconium alloys.

The omega phase transformation will be investigated in beta titanium and zirconium alloys using electron transmission microscopy and single crystal elastic constant measurements. X-ray diffraction will be used to examine diffuse omega reflections in Zr-Nb alloys, and the results incorporated into a theoretical treatment of linear faulting. Mechanical strength will be related to defect structure and microstructure.

Supporting agency address information: Office of Naval Research 471, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0026, SELECTED STUDIES OF ELECTRIC, MAGNETIC, AND THERMAL PROPERTIES OF METALLIC SYSTEMS

S. ARAJS, Clarkson College of Technology, Graduate School, *Potsdam, New York* 13676 (DMR73-07572 A02)

The research program supported by DMR-7307572 will be continued for an additional year. The purpose of the studies is to investigate experimentally--by means of electrical resistivity, thermoelectric power, thermal conductivity, and magnetization measurements--the following properties of metallic systems: a. Electronic structure and interactions among elementary excitations in chromium-base alloys from the viewpoint of magnetic and transport properties. b. The manifestations of the Kondo effect and other electrical resistivity anomalies in palladium-silver, silver-gold, molybdenum, tungsten, molybdenum-tungsten and nickel alloys containing appropriate solvents such as cerium, ytterbuim, iron, cobalt, nickel, manganese, silicon, germanium, chromium, molybdenum, and tungsten. c. The measurements of the Ettinghausen coefficient in gadoliniom, terbium, dysprosium, holmium, erbium, cerium, praseodymium, and samarium. d. The determination of critical indices for the electrical and thermal transport properties in nickel, iron, beta-brass, nickel and iron binary alloys containing silicon, germanium, vanadium, manganese, chromium, various chromium alloys, and rare earth metals.

SUPPORTED BY U.S. Natl. Science Foundation

3.0027, STUDY OF THE FAILURE MECHANISMS IN SUPERHARD MATERIALS USED TO CUT SUPERALLOYS

M. HOCH, Univ. of Cincinnati, School of Engineering, *Cincinnati, Ohio* 45221 (DMR72-03289 A02)

The principal objective of this research is to establish the mechanism of failure of superhard cutting tool materials when they are cutting superalloys. It is expected that from this study, it will be possible to modify existing superhard cutting tool materials to obtain longer life and lower cutting costs.

The superalloys to be cut include Inconel 718, AF95, Haynes Alloy 25, Mar M 302 and A286. The superhard cutting tool materials include C2 and C7 grades of cemented carbides, with and without special TiC, oxides or other coatings and surface treatments; and special oxides and nitrides.

Each of these materials will be characterized by the producers' specifications for composition and processing and by detailed tests for hardness and microstructure.

During the progress of this research, frequent discussions will be held with the members of the Participating Industry Group (producers and users of superalloys and superhard cutting tool materials within the Cincinnati geographic area). This will give immediate feedback to us and keep them fully informed. In addition reports will be provided directly to all the producers and users of superalloys and superhard cutting tool materials to be sure that the maximum use is made of the information developed in this research.

SUPPORTED BY U.S. Natl. Science Foundation

3.0028, NAVY ENVIRONMENT - CORROSION FATIGUE OF STEEL AND TITANIUM ALLOYS
R.P. WEI, Lehigh University, Inst. of Fracture & Solid Mech, *Bethlehem, Pennsylvania* 18015 (DN223484; N00014-67-A-0370-0008)

The objective of this research is to understand the mechanisms responsible for corrosion fatigue failures in steels and titanium alloys used in naval structures.

The rate of fatigue-crack growth in steels and titanium alloys will be determined as a function of partial pressure of water vapor in the atmosphere, test frequency, wave form and temperature. Concurrent investigations of the chemisorption kinetics, reaction mechanisms and activation energies of absorption of water on these same materials will be carried out as a function of temperature and water-vapor pressure. On the basis of the chemical and mechanical studies, kinetic models for corrosion-fatigue-crack growth will be formulated.

Supporting agency address information: Office of Naval Research 471, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0029, NAVY VEHICLE DESIGN AND CONSTRUCTION - STRENGTH DIFFERENTIAL EFFECT IN METAL ALLOYS
W.A. SPITZIG, U.S. Steel Corporation, *Monroeville, Pennsylvania* 15146 (DN223674; N00014-73-C-0092)

Future naval vehicles will require higher strength, higher toughness metal alloys for structural elements. The investigators will look for the sources of the strength differential observed in several metal alloys to better understand a potentially useful contribution to the strength of such alloys. The strength differential refers to the difference in flow stress found for compressive loading as compared to tensile loading in steels and other alloys.

This research effort will center on the effects of imposed hydrostatic pressure on the strength differential effect in steels, titanium, and other alloys. Density and yielding will be measured as a function of hydrostatic pressures to as high as 200,000 psi. A relationship between the strength differential, volume change, and pressure will be developed and compared to theoretical predictions.

Supporting agency address information: Office of Naval Research 471, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0030, RESEARCH INITIATION - ORDERING IN NI-BASED ALLOYS
D. LAUGHLIN, Carnegie Mellon University, Graduate School, *Pittsburgh, Pennsylvania* 15213 (DMR75-10618)

This is a fundamental investigation of a continous ordering transformation in Ni-Mo, Ni-W and Ni-V alloys. These alloys are known to order continuously and have an aligned, periodic, two-phase microstructure. The kinetics of the transformation, the thermodynamic conditions underlying the transformation, and the mechanisms of transformation will be investigated. Lastly, the relationship between strength, composition and microstructure of these alloys will be determined.

SUPPORTED BY U.S. Natl. Science Foundation

3.0031, FATIGUE PROPERTIES OF SPINODAL PRECIPITATION ALLOY SYSTEMS
W.A. SOFFA, Univ. of Pittsburgh, School of Engineering, *Pittsburgh, Pennsylvania* 15213 (DN590017; N00019-75-C-0144)

There are indications that alloy systems exhibiting spinodal precipitation are highly fatigue resistant, possibly due to an unusual level of microstructural stability under cycle loading.

Ni-Ti, Cu-Ti and Cu-Ni-CrS alloys systems which exhibit spinodal precipitation will be investigated to determine mechanical and physical behavoir under cyclic loading.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0032, SOLUBILITY OF HYDROGEN IN RARE-EARTH INTERMETALLICS
W.E. WALLACE, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (AT(11-1)-3429)

In our search for intermetallics which are copious absorbers of hydrogen, we propose to establish the pressure-composition-temperature behavior of the following systems: RCo3-H with R equals Ce, Pr and Nd; RFe3-H with R equals Gd, Tb, Dy, Ho, Er and Th; R2Co7-H with R equals Sm, Tb, Dy, Ho, Er, Tm and Lu.

The rate of absorption and evolution of hydrogen in the above compounds will be determined.

Also, we shall determine the hydrogen mobility in the intermetallics by field gradient pulse NMR.

Results: The following systems have been investigated to date: RCo2 (R equals Pr, Nd, Gd), CeNi2, Pr2Ni7, R2Co7 (R equals La, Ce, Pr, Nd, Gd), RCo3 (R equals Dy, Ho, Er), YNi5, ThNi5, YCo5, ThCo5. On an H- to-metal atom basis, RCo3 compounds were found to have a higher hydrogen storage capability than LaNi5.

Part 4 of 4.

SUPPORTED BY U.S. Energy Res. & Dev. Admin. - P.R.D.

3.0033, STRUCTURE AND PROPERTIES OF ZIRCONIA ALLOY SYSTEMS
V.S. STUBICAN, Penn. State University, School of Engineering, *University Park, Pennsylvania* 16802 (DMR74-08832)

The scope of this research encompasses studies of the phase equilibria, mechanisms and kinetics of phase transformations and microstructure in some zirconia alloy systems. The phase diagram and particularly the cubic-tetragonal-monoclinic phase boundaries for the system ZrO2-Y2O3 will be redetermined. The temperatures of the athermal (martensitic) on-heating and on-cooling reactions for several compositions between pure ZrO2 and the cubic ZrO2-Y2O3 field will be obtained. Kinetics of the isothermal decomposition of ZrO2-Y2O3 tetragonal and cubic solid solutions will be studied by using high temperature and hydrothermal techniques. The possible ordering processes in the cubic field of ZrO2-Y2O3 system will be investigated by using neutron diffraction. The microstructure resulting from various reactions will be observed by using transmission electron microscopy. Special attention will be paid to the formation of domains and precipitates which may influence mechanical, thermal and electrical properties of this system.

The data obtained will then be used for the construction of the ZrO2-Y2O3 phase diagram.

SUPPORTED BY U.S. Natl. Science Foundation

3.0034, POLLUTION CONTROL IN AIRCRAFT MATERIALS
W. HALLOW, U.S. Navy, Air Vehicle Technology Dept., *Warminster, Pennsylvania* 18974 (DN581140)

Develop the technology necessary to abate aircraft materials pollution via materials and processes control or modification.

The approach will be to survey the materials and material applications used in the field and to evaluate how those materials/applications can be changed to abate pollution and reclaim spent materials. Abatement will be achieved through introduction of process changes, new processes, materials changes, and materials control.

Supporting agency address information: Naval Air Systems Command (340E), Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0035, ENERGY STORAGE BY METAL HYDRIDES - THE CHEMISORBED INTERMEDIATE
T.B. FLANAGAN, Univ. of Vermont, School of Arts, *Burlington, Vermont* 05401 (MPS74-20161)

This research will investigate the equilibrium between chemisorbed and absorbed hydrogen in those metallic and intermetallic/hydrogen systems which may be useful, and economically feasible, for the large- scale transport and storage of hydrogen as energy sources. Systems which will be investigated are: Ti/H2, Nb/H2, Zr/H2, Ta/H2, and AB5/H2, where A is a rare

earth metal and B is either cobalt or nickel. For these and other such systems there is a notable absence of information concerning the chemisorbed hydrogen which serves as the intermediate between the absorbed and gaseous states. The thermodynamic parameters of chemisorption for this intermediate state will be determined. Equilibrium constants relating the surface coverage to the concentration of interstitially absorbed hydrogen will be determined for these various metal and intermetallic/hydrogen systems.

SUPPORTED BY U.S. Natl. Science Foundation

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, TRANSONIC COMPRESSOR INVESTIGATION

M.H. VAVRA, U.S. Navy, Postgraduate School, *Monterey, California* 93941 (DN498063)

To investigate the flow phenomena in impulse-type transonic compressor stages to establish more precise performance prediction methods.

To design, build, and install a transonic compressor test rig which permits the determination of the flow phenomena ahead and after each row of blades with modern instrumentation.

Supporting agency address information: Naval Air Systems Command 310, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0002, ELF FADING STUDY

W.L. IMHOF, Lockheed Missiles & Space Co., *Palo Alto, California* 94304 (DN575307; N00014-75-C-0954)

In Navy ELF radio propagation measurements, unexplained amplitude degradation has occured frequently. It is postulated that ene electron precipitation into the lower D-region ionsphere is the source of the amplitude degradation. The verification of this postulate is important in the design and sizing of the sanguine ELF FBM communication system.

Electron precipitation data taken by one previous and one currently operating ONR ionospheric research satellite will be analyzed to determine the correlation of the ELF fading with electron precipitation along the propagation path. These results will then be used to predict the magnitude of fading due to PCA events and other high energy electron precipitation events, thus allowing a design margin to be built into the sanguine system.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0003, ASYMPTOTIC INTEGRATION OF THIN SHELL EQUATIONS

C.R. STEELE, Stanford University, School of Engineering, *Palo Alto, California* 94305 (GK-41226)

The objective of this investigation is the discovery and utilization of new methods for the approximate integration of the equations of thin shell theory.

Specifically, the research is concerned with the exploration of the 'geometric optics' solution to the linear equation for an isotropic shell of constant thickness with static loads. In addition, an effort will be made to extend the approach to shells of variable orthotropic elastic properties and variable thickness, and to consider nonlinearities. Finally, some consideration will be given to an extension to the analysis of the transient dynamic response of a general surface.

SUPPORTED BY U.S. Natl. Science Foundation

4.0004, FERROMAGNETIC FLUIDS FOR BEARING, SEAL, AND PROPULSION CONCEPTS

T.B. JONES, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (DN475073; N00014-67-A-0299-0020)

To investigate the basic characteristics and properties of ferromagnetic fluids as required to assess their potential and applicability to various naval propulsion devices, including bearings, gears, seals, and advanced water propulsion concepts.

Theoretical and experimental investigations of ferromagnetic fluids are being conducted within the topical areas of magnetization as a function of temperature and field, effects of nonuniform fields, the evolution of ferrofluid spikes, effects of time-varying fields, and the effects of nonspherical particle shapes.

Supporting agency address information: Office of Naval Research 473, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0005, A STUDY OF THE MECHANISM AND CONTROL OF JET SCREECH

A.L. ADDY, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The phenomenon of 'jet screech' is associated with the flow from a sonic or supersonic nozzle. A discreet, high-energy tone is generated at the nozzle exit under certain back pressure conditions. The mechanism responsible for jet screech is thought to be a resonance phenomenon due to the interaction between vortices shed at the nozzle exit and convected downstream along the jet surface and shock waves generated within the jet. Various coupling models are being studied and experiments are being conducted to determine the nature of this coupling mechanism. Methods of controlling and utilizing the jet screech phenomenon are also being considered.

SUPPORTED BY University of Illinois

4.0006, MACH SLANTING AND THE MHD GENERATOR

C.E. BOND, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

This research is directed toward an assessment of the possible effects of Mach slanting on the plasma stability and the efficiency of existing and proposed MHD electric power generators.

SUPPORTED BY University of Illinois

4.0007, SEPARATED FLOWS IN TRANSONIC AND SUBSONIC FLOW REGIMES

W.L. CHOW, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DAHC04-75-G-0041)

Description: Studies of separated flows, particularly flow reattachment and redevelopment, within the transonic and subsonic regimes are carried out with the aim of understanding the underlying basic governing flow mechanisms. The knowledge generated from these investigations will be useful for improvement of performance and reduction of fuel consumption for any vehicles operating within these flow regimes. It would also be applicable to any flow devices of energy conversion and transmission.

Bibliographic references: Chow, W.L., and Spring, D.J., 'The Viscous Interaction of Incompressible Separated Flows,' Tech. Rept., RD- 73-22, U.S. Army Missile Command, Redstone Arsenal, Alabama, Aug. 1973, Revised Edition, May 1974.

SUPPORTED BY U.S. Dept. of Defense - Army

4.0008, TRANSMISSIBILITY OF A POROUS SQUEEZE FILM SUPPORT FOR RIGID ROTOR

C. CUSANO, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The purpose of this analytical study is to investigate the transmissibility of a porous squeeze-film support for rigid rotors. The solution is based on the short-bearing approximation and incompressible lubrication. Data for steady state and transient characteristics are obtained over a wide range of operating conditions. These data are compared to those obtained for a solid bearing.

SUPPORTED BY University of Illinois

4.0009, MINIMIZING THE DYNAMIC RESPONSE CAUSED BY UNBALANCES IN ROTOR SYSTEMS
C. CUSANO, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The purpose of this analytical investigation is to minimize the dynamic response, caused by unbalances, of flexible rotor with thin, rigid disks. The distributed mass of the rotor is approximated by lumped masses located at the position of the disks. The gyroscopic moment caused by the disks is included in the analysis and the rotor is assumed to be supported on fluid-film bearings. The problem formulation can be stated as follows: given N disks with specified unbalances, what is the optimum orientation of these unbalances such that the dynamic response caused by these unbalances is minimized.

SUPPORTED BY University of Illinois

4.0010, PROBALISTIC MINIMUM WEIGHT ANALYSIS
H.H. HILTON, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

An analytical method has been developed for designing structures having a prescribed probability of failure so that overall weight is minimum. The solution is obtained for structures consisting of components having normal and beta-distributed applied and failure stresses and is applicable to combined loading conditions. It is assumed that the loading conditions are such that general relations can be used to relate the mean stresses to the cross-sectional area.

SUPPORTED BY University of Illinois

4.0011, VIBRATION OF STIFFENED SHELL STRUCTURES
Y.K. LIN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

Free vibration of a thin cylindrical shell stiffened circumferentially by rings at equal intervals is investigated theoretically.

SUPPORTED BY University of Illinois

4.0012, VIBRATIONAL RELAXATION OF EXCITED SPECIES OF INTEREST TO CHEMICAL LASERS
L.H. SENTMAN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

A classical model for V-R and V-V energy transfer between two dissimilar diatomic molecules has been developed. For the hydrogen halides, whose relaxation is generally accepted as being governed by V-R energy transfer, the relaxation times predicted by the present theory agree reasonably well with the experimental data. In particular the temperature dependence of the V-V relaxation times for N2-HI, N2-DI, and N2-HF is predicted. To extend the range of validity of this model to low temperatures (300 degrees K), the theory is being generalized to include long-range attractive forces.

SUPPORTED BY University of Illinois

4.0013, LASER CAVITY FLOW MODELING
L.H. SENTMAN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The rotational nonequilibrium model of a chemical laser developed previously is being used to study the line suppression and single line performance of chemical lasers. Preliminary results indicate that when two lines which contain 30% of the total power are suppressed, there is only a 5% decrease in total power and that it may be possible to obtain 55% of the multi-line power in single-line operation.

SUPPORTED BY University of Illinois

4.0014, DEVELOPMENT OF BERYLLIUM-TITANIUM COMPOSITE FAN BLADES FOR NAVAL AIRCRAFT ENGINES
M. HERMAN, General Motors Corporation, *Indianapolis, Indiana* 46206 (DN590036; N00019-75-C-0264)

Develop improved beryllium/titanium composite extrusions by optimizing process variables and obtain the design criteria for prototype fan and compressor blades.

Develop and evaluate a process to integrally forge a root attachment on the end of extruded beryllium/titanium composite blade forgings.

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0015, DUAL BAND ARRAY TECHNIQUE
R.J. MAILLOUX, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245580)

AF function - aircraft to satellite communication and other aircraft flush-mounted applications. Deficiency - improved antenna performance is required, particularly to achieve independent beams at widely spaced frequencies. Research - investigation of new antenna techniques for dual-band array elements. How research contributes - most present array techniques allow only one beam to be scanned at one given frequency. The several exceptions that do allow dual independent beams have relatively low aperature efficiency. New dual-band array techniques would allow light weight arrays with efficient use of the aircraft mounting space.

The approach is to investigate the properties of a particular kind of dual-band phases array technique that used dielectric slab-loaded waveguide elements to provide separate control of two widely spaced frequencies.

Supporting agency address information: AF Cambridge Research Laboratories LZ, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0016, NAVY VEHICLE DESIGN AND CONSTRUCTION - HIGH GRADIENT MAGNETIC SEPARATION OF WEAR PARTICLES FROM FLOWING LIQUID LUBRICANTS
J. OBERTEUFFER, Magnetics Engin. Assoc. Inc., *Cambridge, Massachusetts* 02141 (DN575130; N00014-75-C-0315)

The objective is to assess the feasibility of using high gradient magnetic separation techniques to remove micron and submicron sized wear debris particles from lubricating oil of Navy aircraft, ship, and submarine lubrication and hydraulic systems. Use of this capability will increase the reliability of these machinery systems.

The approach is to determine the efficiency and determine the limitations of the high gradient magnetic separation technique. Magnetic field strength, flow velocity, loading, viscosity, magnetic matrix design will be varied to optimize design and determine operational limitations.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0017, NAVY VEHICLE DESIGN AND CONSTRUCTION - DESIGN OF WELDED STRUCTURES
K. MASUBUCHI, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DN575116; N00014-75-C-0469)

Problems associated with the weld joints in Navy vehicles fabricated by welding can affect their life and performance. This research is aimed at developing techniques to predict and control the residual stresses and distortion developed in welded structures.

The program will have two main tasks. In the first phase, the investigator will develop a monograph for predicting stresses and strains in welded steel structures. The monograph will include sections on heat flow, thermal stresses, residual stresses and distortion, strength of welds, and defects in welds and their significance. The monograph will be directed primarily toward designers and welding engineers. The other phase will emphasize analytical procedures to predict and control distortion in welded aluminum structures. This phase is particularly important to SES fabrication.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0018, UPGRADING THE MILLSTONE HILL RADAR FOR INTERNATIONAL MAGNETOSPHERE STUDIES

J.V. EVANS, Mass. Inst. of Technology, Lincoln Laboratory, *Lexington, Massachusetts* 02173 (DES75-02579)

This grant will allow the upgrading of the Millstone Hill incoherent scatter facility by addition of a 150' Very High Frequency (VHF) dish so that it can meet the requirements of the International Magnetospheric Study (IMS). The upgrading was third on the Academy recommendations for IMS. Items one and two have already been accomplished.

SUPPORTED BY U.S. Natl. Science Foundation

4.0019, USE OF CERAMICS IN AIRCRAFT ENGINE BEARINGS

M.L. TORTI, Norton Company, *Worchester, Massachusetts* 01606 (DN330006; N00019-74-C-0157)

The objective of this procurement is to investigate the utility of ceramics as a means of increasing performance capabilities and service life of environmental resistance of rolling element bearings for use in turbine engines.

The load life relationships of steel on ceramic and ceramic on ceramic will be evaluated in rolling contact fatigue tests. Aircraft quality precision rolling element bearings with ceramic races and rollers will be designed, fabricated and tested. Silicon nitride and/or silicon carbide are the materials of primary interest.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0020, TRANSIENTS IN TURBOCOMPRESSORS

W.C. GRIFFITH, Univ. of North Carolina, Graduate School, *Raleigh, North Carolina* 27607 (DF040620; AF-AFOSR-2802-75)

The purpose of this task is to investigate the influence of flow distortions on axial flow compressor performance. This problem has been identified by the AFAPL as well as industry as a high priority research need. The effort will be both experimental and analytical. It is a joint university (NC State) and industry (United Aircraft Research Laboratories) effort. A series of experiments will be performed to make (1) measurements of steady-state flow properties at sufficiently large distances from the blade row to be uninfluenced by local unsteadiness, (2) transient measurements in the stationary frame of reference within the near field of the rotating blade row, and (3) unsteady measurements in the rotating frame of reference both on the blade surfaces and in the passages between blades. Experiments will be performed on the UARL large-scale rotating rig to measure such quantities as static pressure, total pressure, and velocity upstream and downstream of the rotor and in the blade passages. In addition, surface pressure and skin friction will be measures on the individual blades. These experiments will be designed so as to identify the important parameters governing the fluid dynamic response of the stage and the insights thus gained will be used to develop the desired analytic techniques.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0021, ENGINEERING AND OTHER SUPPORT FUNCTIONS FOR FLUID DYNAMICS RESEARCH

K. BALL, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (DF213660; F33615-72-C-1789)

AF function - aerospace vehicles (hypersonic flight). Deficiency - lack of experimental data for determining aerodynamic loads and flow conditions around hypersonic flight vehicles. Research - operations of fluid dynamic facilities and their subsystems for experimental aerodynamic testing. How research contributes - provides data pertinent to the development of missiles, aircraft and systems components. Experimental research on high-speed fluid mechanics problems is carried out in-house by the Aerospace Research Laboratories utilizing unique facilities capable of simulating flight at speeds to Mach 20 and altitudes up to 300,000 ft.

Typical of the investigations made with these facilities are studies of shock-wave boundary layer interactions, gas/surface heat transfer, novel vehicle configurations, and determination of dynamic stability parameters for simple bodies. It is the purpose of this program to provide a contractual arrangement which will enhance and support these various research efforts in terms of functions pertinent to the uses and operation of the laboratory complex. The contractor's efforts in the utilization of these facilities involve the creative design, fabrication, testing of models and reduction of the ensuing data for the preparation of reports, specific instrumentation as may be required for a research effort will be provided by the contractor. Specific tasks are assigned in support of the research efforts assigned to the project. Skilled manpower is provided to support the research efforts as required.

Supporting agency address information: Aerospace Research Laboratory LF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0022, SENSORS THRESHOLD SIGNAL STUDY

G. RODRIGUEZTORRES, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF101980)

To perform a comparison study of the threshold signal capability at low target contrast (below 0.05 modulation contrast) levels as a function of input irradiance of an RBV electronic camera, a CCD camera, a 162mm image amplifier, and a photographic emulsion loaded camera.

An optical set-up will be put together to provide input bar targets of known spatial, contrast, and irradiance level characteristics for the test sensors. The input bar targets will be of various low contrast and AVG irradiance levels. The aerial bar target image presented to the sensors by the respective sensor optics will be measured as a function of spatial frequency. Trained observers, three, will determine the sensor resolving power as a function of irradiance level and input target contrast. Sensor signal-to-noise ratio measurement will be made.

Supporting agency address information: AF Avionics Laboratory RWI, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0023, FEASIBILITY OF ARTIFICIAL DOPPLER SHIFTS BY R.F. HEATING OF THE D REGION

A.J. FERRARO, Penn. State University, School of Engineering, *University Park, Pennsylvania* 16802 (DN575276; N00014-75-C-0971)

The ionospheric D-region is important to several Navy communications systems and to potential HF over-the-horizon radar systems. This theoretical study is concerned with D-region heating effects caused by the use of high power HF transmitters. These 'heaters' can perturb the D-region which can affect either communications or the radar.

The contractor will initiate a mathematical study concerned with the creation of artificial Doppler shifts on ionospherically propagated high frequency electromagnetic waves. The study will consider the effects caused to HF radar signals, investigate day/night differences, and specify the type of facility and geometry required to produce modification of radar and communications signals.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0024, VISIT OF A SPECIALIST OF NLR TO CALSPAN TO EXCHANGE EXPERIENCE ON SHOCK WAVE - BOUNDARY LAYER INTERACTION

J.W. KOOI, Natl. Aerospace Laboratory, *Amsterdam, the Netherlands* (DF289380; AF-AFOSR-2815-75)

AF function - insufficient knowledge of scale effects in shock- boundary layer interactions at transonic speeds. Research - an exchange of research specialists will take place between Calspan in the U.S. and NLR in Amsterdam, the Netherlands. Both specialists are working in the same area but their respective experiments contain a number of significant differences. How research contributes - with the programmed exchange of spe-

cialists it will be possible to increase the outcome of the experiments because experience and data can be exchanged which will allow for the evaluation of experimental techniques, especially those which are used to determine the characteristics of the shock wave- boundary layer interaction, to study the influence of model dimensions on the interaction, and to study unit Reynolds number effects on the interaction.

The principal investigator of the National Aerospace Laboratory (NLR), will travel to Calspan for approximately one month to observe and assist the experimental work in the Calspan facility.

Supporting agency address information: European Ofc of Aerospace Rsch and Dvlpmt NRE, Box 14, FPO New York, N.Y. 09510

SUPPORTED BY U.S. Dept. of Defense - Air Force

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS

E.J. HODGKINS, Auburn University, Agricultural Experiment Sta., *Auburn, Alabama* 36830 (0060563; ALA00335)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information of physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, serial photography, and space imagery when appropriate.

PROGRESS: Information and data gathering in 1973 consisted of the following: Extensive field tours for notes and photographs in Florida and Oklahoma. T. H. Silker accompanied the Chairman in Oklahoma, along with specialists in soils and geology from Oklahoma State University, the U.S. Forest Service, and the SCS. Intensive gathering of printed material and maps done by C. Kaufman in Florida, N.E. Linnartz in Louisiana, T.H. Silker et. al. in Oklahoma, and D. Moehring in Texas. These materials are concerned with soils, geology, landforms, and vegetation of the respective states. At its annual meeting at Stillwater, July 30-August 2, the Technical Committee decided to utilize ERTS satellite imagery for the development of state and regional landform maps. Miller of Mississippi had already successfully used satellite imagery to delineate physiographic divisions in northwest Alabama and northeast Missippi. Based on this experience, 9 in. x 9 in. negative format coverage, in Bands 5 and 7, were ordered for all of Alabama and Mississippi. These were enlarged and printed as positives on a scale of 1:500,000. They will be used for the construction of a landform map of the two-state area. If this work is successful, the technique will be applied to the entire Southeastern Region.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0002, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS

H.A. HOLT, Univ. of Arkansas, Agricultural Experiment Sta., *Fayetteville, Arkansas* 72701 (0061232; ARK00759)

OBJECTIVE: Organize physiographic land patterns into a system having a significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information on physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, aerial photography, and space imagery when appropriate.

PROGRESS: Materials requested by Dr. Hodgkins of Auburn have been contributed as they were available. We have agreed to support the use of ERTS satellite imagery for this project.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0003, DEVELOPMENT OF AN ACOUSTIC SOUNDER NETWORK FOR AIR POLLUTION AND LAND USE APPLICATION

E.E. UTHE, Stanford Research Institute, *Menlo Park, California* 94025 (AEN73-02918 A01)

Two of the most important atmospheric parameters in determining the transport and dispersion of air pollution are winds and the 'mixing depth' - the depth of the mixed layer of the atmosphere through which surface-generated pollutants can freely mix. The influence of mixing depth in determining ambient pollution concentration is especially strong in urban areas of the West Coast where the characteristic marine inversion restricts the mixing depth to lower altitudes. Pronounced topographic and demographic variations within West Coast urban regions also cause both the inversion height and wind to vary considerably on small scales in space and in time. As a result, climatological data on both mixing depth and winds must be provided on rather fine spatial and temporal scales in order to be useful to West Coast planning. This project is evaluating the application of a network of acoustics sounders for reliable, unattended and continuous observations of mixing depth over the San Francisco Bay Area. This project will: acquire climatological data on mixing depth behavior at a number of Bay Area locations; develop analysis and interpretation techniques for deriving mixing depths and other information; evaluate the utility of the acoustic sounder for measuring mixing depths; investigate techniques for transmitting sounder data to a common location for operational use; and disseminate data and methodology to appropriate land use planning agencies and air pollution monitors.

SUPPORTED BY U.S. Natl. Science Foundation

5.0004, REFRACTION SPECTROSCOPY MEASUREMENTS IN THE MICROWAVE REGION

H. LIEBE, U.S. Dept. of Commerce, Inst. For Telecomm. Science, *Boulder, Colorado* 80302 (9-342; 5-13155)

Objective: To provie improved values of line strength and width-- including pressure broadening--of selected intervals in the 60 GHz band of O2. These laboratory values are needed to calculate weighting functions for Nimbus microwave sounding experiments and the microwave portion of the Tiros N operational sounder.

Approach: To use dispersion spectroscopy techniques in the laboratory to make measurements and then deduce the line parameters.

Progress: (a) Work on the 7 plus and 9 plus lines has been completed. (b) Zeeman splitting measurements have been suspended due to staff limitations. (c) Work on th 3 plus/9 minus doublet is about 30 percent completed.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0005, DUAL-DOPPLER RADAR INVESTIGATION OF WIND FIELDS IN SEVERE STORMS

G.C. LITTLE, U.S. Dept. of Commerce, Wave Propagation Laboratory, *Boulder, Colorado* 80302 (NSF CA-160)

This grant is to the National Oceanographic and Atmospheric Administration (NOAA) to investigate wind fields in severe storms, especially hailstorms, through the use of a dual-Doppler radar. The work will be carried out in the Colorado area in conjunction with the National Hail Research Experiment managed by the National Center for Atmospheric Research under NSF sponsorship. The NOAA Wave Propagation Laboratory has developed a technique of using the Doppler information from two separated radars, scanning a common volume of atmosphere in which there is precipitation, to observe the total three-dimensional wind field in the volume. The particle velocity fields in a given plane can be simply calculated from the radial components sensed by each radar. Then the air motion in the plane can be found by estimat-

ing the terminal velocities of the particles and subtracting their contribution to the total particle velocity field. A major portion of this effort is reduction and analysis of the radar data.

SUPPORTED BY U.S. Natl. Science Foundation

5.0006, RANGE INVENTORY AND EVALUATION
R.S. DRISCOLL, Colorado State University, U.S.D.A. Rocky Mtn. For. Sta., *Fort Collins, Colorado* 80521 (0000180; RM1707)

OBJECTIVE: Develop methodology and techniques that would serve as a basis for conducting broad appraisals of range resources.

APPROACH: To develop principles and criteria for range site classification and evaluation, based on vegetation, soils, and physiographic relationships investigated through field study to define ecosystem characteristics to use as descriptions of site and estimators of site potential. Development of biological and statistical bases for the evaluation of condition and trend data; including the evaluation of data from 3-step transects will be approached through detailed analysis of existing 3-step condition data to determine the effectiveness of the method to indicate meaningful changes in vegetation over time. Develop inventory methods using remote sensing techniques for the identification and quantification of vegetation species, plant communities, and condition and other features of the range and wildlife environment; test and define use of various remote sensing systems to range resource analyses and surveillance. Multiband aerial photography and photo-like imagery will be examined.

PROGRESS: Vegetation mapping and identification of individual plants using aerial photographs is frequently subject to interpreter error. Film image density measured by scanning microdensitometers provides a means to reduce some of this error. Image density differences in color infrared aerial photos were used to discriminate individual shrub and tree species of a pinyon-juniper plant community. Image density also discriminated six general community systems: ponderosa pine, spruce-fir, big sagebrush, native grasslands, and seeded grasslands. However, sites and cultural treatments within native grasslands and a ponderosa pine forest were not so easily discriminated even though visual differences were apparent in the photos. Estimates of animal mortality, especially game animals, are important to game managers to evaluate game management programs. Five aerial photointerpreters detected and correctly identified an average of 68 percent of a known number of mule deer carcasses in a sagebrush area using 1:2000 scale color infrared aerial photographs.

SUPPORTED BY U.S. Dept. of Agriculture - F.S.

5.0007, REMOTE SENSING SURVEYS FOR AGRICULTURAL STATISTICS
D.H. VONSTEEN, U.S. Dept. of Agriculture, Research Division, *Washington, District of Columbia* 20250 (0016918; RD-3)

OBJECTIVE: Develop techniques of automated data extraction and statistical methods for using remote sensing data recorded as photographs or multispectral imagery, with reference to field crops, fruit trees and livestock estimates.

APPROACH: Conduct experiments using ground photography, aircraft and satellite imagery in cooperation with universities. Automated classification programs will be developed to identify crop species and to assess crop damages. Automated discrimination programs will be developed to make fruit counts on citrus and deciduous tree crops. Ground truth will be obtained on a sample basis as needed to interpret and evaluate the results of sensor data. If remote sensing data are a feasible source of supplementary informatiion, statistical methods will be developed for collection, interpretation and analysis.

PROGRESS: A study to determine if ERTS multi-spectral scanner data can be used for crop identification is nearly complete. The study area included parts of 4 different states, central Idaho, southwest Kansas, southeast Missouri, and east central South Dakota. Field crops grown in one or more of these areas include corn, cotton, soybeans, oats, sunflowers, sugar beets, grain sorghum, and Irish potatoes. The study period was to have been the 1972 crop season. Because of the delayed (late July) ERTS launch date, cloud-free imagery generally was not obtained before mid-September. Correct crop classification rates averaged 90 percent in Kansas, but less than 40 percent in Idaho and in South Dakota.

SUPPORTED BY U.S. Dept. of Agriculture - S.R.S.

5.0008, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS
C.M. KAUFMAN, Univ. of Florida, Agricultural Experiment Sta., *Gainesville, Florida* 32601 (0060699; FLA-FY-01586)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information on physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing authorities, aerial photography, and space imagery when appropriate.

PROGRESS: Printed materials and maps concerned with geology, soils, landforms and vegetation of the State were forwarded to the project chairman. Dr. Earl J. Hodgkins, Auburn University, who is doing most of the gathering of field data.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0009, LIGHT SCATTERING FROM IRREGULAR DIELECTRIC PARTICLES 12178-GS
G.D. WARD, Univ. of Florida, School of Engineering, *Gainesville, Florida* 32601 (DA0E5579; DAHC04-75-G-0100)

An experimental program for measuring scattering from irregular particles whose dimensions are comparable to the incident wavelength is planned to test theoretical solutions already developed. The inverse problem of determining particle shape from scattering data also will be explored. Relevance - the results will have direct application to the ECOM ground target signature program--the design of laser systems--and in the development of atmospheric remote sensing techniques for probing of cloud microstructure and radiation exchange in the atmosphere relevant to prediction of cloud and fog formation and dissipation.

The first test of the theory will be based on measurements of optical scattering from a single tumbled particle using a differential II photometer. Scattering intensity as a function of wavelength and angle will be recorded. More complex measurements using a differential (polar) nephelometer which contains two tunable optical sources with output from 360 nm to 1000 nm will then be pursued. Measurements of scattering from various shaped and oriented particles will be made.

Supporting agency address information: AMC Army Research Office, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0010, USE OF SATELLITE DATA IN NUMERICAL WEATHER PREDICTION OVER THE TROPICS
T.N. KRISHNAMURTI, Florida State University, School of Arts & Sciences, *Tallahassee, Florida* 32306 (8-211; 04-5-158-26)

The objective of the project is the use of satellite data collected during the GATE period (Summer, 1974) in conjunction with a numerical weather prediction model. Under a previous grant the principal investigator has developed expertise in the acquisition and amalgamation of winds derived from cloud motions. Current plans are: 1. To do 100 days of analysis of high and low level winds for the GATE period. 2. To use the analysis of (1) with sea surface temperatures to examine questions related to the parameterization of cumulus convection, especially of the A/B and B scales. 3. To do numerical forecasting with real data over the GATE A-scale region.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0011, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS
J.T. MAY, Univ. of Georgia, Agricultural Experiment Sta., *Athens, Georgia* 30601 (0060780; GEO00025-MS)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information on physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, aerial photography, and space imagery when appropriate.

PROGRESS: Activities continued in Oklahoma and Mississippi. No active work in Alabama this year.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0012, PERFORMANCE AND DYNAMICS OF A VERTICAL-AXIS WINDMILL

K.R. SIVIER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

This project involves the study of the performance and response dynamics of the Savonius type, vertical-axis windmill, together with a review of the economics of the vertical-axis windmill, as an alternate energy source. The performance and response dynamics studies are primarily experimental and are being carried out in the environmental test section of the University's low-speed wind tunnel. Measurements are being made of the power output and rotor drag as functions of rotor geometry, rotor speed, and wind speed. Data on rotor starting torque are also being obtained. The initial work is being done under steady wind conditions and will be followed by an examination of the rotor response to simulated lateral wind gusting.

SUPPORTED BY Granite City Steel Corporation - Illinois

5.0013, SOIL LANDSCAPE CHARACTERISTICS AFFECTING LAND USE PLANNING AND RURAL DEVELOPMENT

D.P. FRANZMEIER, Purdue University, Agricultural Experiment Sta., *Lafayette, Indiana* 47907 (0059835; IND01735)

OBJECTIVE: Define, map, and evaluate soil landscape units in terms of alternative land uses in rural and suburban areas. Develop and publish soil landscape guides for land use planning and rural development.

APPROACH: Involve representatives from two or more agencies or disciplines in the planning, execution, and analysis. Evaluate the landscape units by the employment of new techniques in remote sensing and photo-imagery, and endeavor to perceive new delineations in the landscape which can also be quantified. Attempt to develop interpretive materials for some of the newer audiences and potential users of the soil landscape analysis and to develop generalized maps of varying scales. An ultimate goal is to develop a regional land resource map and data bank from which can be derived specific guides in tabular or graphic form for alternate land use planning and management.

PROGRESS: Information is being developed and organized to aid in interpretation of detailed (1:15,840 or 1:20,000) and general (1:190,000) soil maps. The following kinds of information have been compiled and placed in computer storage; physical, chemical and yield potential data for detailed soil map units; composition of general soil map units by soil series; and composition of soil series by slope and erosion phases. The relative productivity of individual farms can be calculated by digitizing detailed soil maps, entering the coordinates of land ownership, and combining this information with productivity index estimates. The relative productivity values are used by tax assessors to evaluate farm land. The relative productivity of the soil associations shown on the general soil map and other interpretations such as power requirements for tillage operations or suitability for septic tanks can also be calculated from stored data. This information will be of great value in developing state land use plans which are receiving increased emphasis in U.S. and state governments. The general soil maps were also compared with imagery from the ERT Satellite. In Indiana and some other states this imagery is useful as a base for developing general soil maps at scales of around 1:50,000 to 1:500,000.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0014, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS

N.E. LINNARTZ, Louisiana State Univ. Systems, Agricultural Experiment Sta., *Baton Rouge, Louisiana* 70803 (0060824; LABO1574)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information on physiography, spills, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, aerial photography, and space imagery when appropriate.

PROGRESS: The S-84 Technical Committee met at Oklahoma State University on July 31, 1973, to discuss progress and formulate future plans. No field work has been done in Louisiana as yet. Plans were made for purchase of ERTS imagery (scale 1:500,000) to cover the entire region with each cooperating station to pay its pro rata share of the cost. This imagery will be used to delineate landforms in each state during the 1974 meeting of the Technical Committee.

SUPPORTED BY Louisiana State Government - Baton Rouge

5.0015, ROCKET INVESTIGATION OF ELECTRON PRECIPITATION TRIGGERED BY VLF EMISSIONS

D.L. MATTHEWS, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (OPP75-03516)

To understand wave-particle interactions in the magnetosphere, it is necessary to observe the emission wave spectrum and electron energy and pitch angle distribution energy over a wide range. It is proposed to perform a controlled wave-particle interaction experiment by making in situ field and particle measurements at altitudes 250 km. Three Nike-Tomahawk (at least one to be launched in a natural event and at least one launched during an artificially stimulated event) rockets will be instrumented with proven design detectors having an energy range 300 eV E 1 MeV and capable of measuring pitch angles from 0 degrees up to 120 degrees. The detectors will consist of three electrostatic analyzers for lower energy and three solid state spectrometers with pulse height analyzers for higher energy; three units for each energy range will provide full pitch angle coverage for down-coming electrons. Direct energy and pitch angle measurements will be made of trapped electrons and electrons which have been precipitated by naturally and artificially stimulated emissions (ASE). The Siple 21 km antenna and transmitter will be used to initiate the ASE. Very-Low Frequency (VLF) will be measured, in situ, by another group. There will be space aboard the rocket for other experiments. It is expected that the analysis will lead to increased understanding of the precipitation process and its relationship to the plasmapause. The rockets, flight hardware, package integration, and launch and ground support personnel and instrumentation will be furnished by the National Aeronautics and Space Administration (NASA).

SUPPORTED BY U.S. Natl. Science Foundation

5.0016, ANALYSIS OF SYNCHRONOUS DUAL-CHANNEL QUANTITATIVE INFRARED DATA FOR SOIL MOISTURE DETERMINATION

L.A. LESCHACK, Development & Reso. Trans. Co., *Silver Spring, Maryland* 20902 (7-839: 4-35308)

In the work performed under the initial phase of the contract (FY 74), a study was made correlating quantitative, dual-channel, airborne IR data at two wavelengths with point soil moisture values at an Office of Hydrology Test site near Scipio, N.Y. Results indicate that both the 5 micron m and 10 micron m IR data samples were drawn from normally- distributed populations, although the 5 micron m sample appeared to be comprised of two different normal distributions. The soil moisture and IR data sets as a whole were uncorrelated. When the data pairs were divided into positive and negative subsamples, statistically-significant correlations were obtained. The physical significance of this result is not obvious, and either additional data collection or numerical modelling, or both, are required to properly understand these relationships.

The objective to be met under the extension of the contract is to determine the causes for the relationships found during the initial phase of the study. In lieu of additional costly airborne and ground data collections, an analysis will be performed using a presently existing theoretical model. The model, essentially an equilibrium surface temperature simulator, predicts the surface temperature for any given point on the terrain given the four components of the energy budget (net radiation, soil heat flux, sensible heat flux and latent heat flux). By incorporating the Scipio soil moisture variations, the model will generate the corresponding surface temperature variations. These in turn can be used to calculate the respective variations in 5 and 10 micron m brightness temperatures for comparison with the Scipio aircraft IR data.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0017, STUDY OF WATER VAPOR ABSORPTION FROM 500-560 CM-1
J. STRONG, Univ. of Massachusetts, School of Arts & Sciences, *Amherst, Massachusetts* 01002 (9-113; 04-5-158-61)

Objective: To obtain data on spectral absorption of water vapor and water vapor-nitrogen and/or air mixtures for the computation of atmospheric transmittance for use in the interpretation of data obtained by environmental satellites.

Approach: The spectral absorption of moist nitrogen and air will be measured in the region from 500-550 cm to the minus first power with a geometrical path of 180 meters at a resolution of approximately 0.12 cm to the minus first power.

Progress: Measurements in this spectral region with samples of pure water vapor have been completed. The optical installation allowing effective double beaming was successfully installed and used in the experiments.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0018, SWIR STRATOSPHERIC BACKGROUND
J.P. DYBWAD, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244220)

AF function - strategic defense, specifically the DSP satellite system. Deficiency or opportunity - stratospheric SWIR background radiance level is unknown, and is limiting system parameters. Objective - to determine stratospheric SWIR background radiance. How research contributes - background radiance data are required for assessment of DSP system performance capability.

A sensitive SWIR telescope-spectrometer system will be designed and built. It will be operated from the AFCRL stabilized balloon platform. Highly accurate and stable pointing for a telescope is presently provided, but reliable means of in-flight calibration must be devised to obtain absolute radiance measurements. Theoretical models will be utilized to plan efficient observations, and experimental data will be correlated with measured aerosol concentrations. Program completion will depend primarily on timely balloon launches from different geographical latitudes.

Supporting agency address information: AF Cambridge Research Laboratories OP, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0019, SATELLITE RADAR STUDY
W.B. GOGGINS, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245250)

AF function - strategic and tactical warfare. Deficiency - rainfall rates and cloud heights can not be presently sensed from a meteorological satellite. Objective - to investigate the feasibility of using an active electromagnetic sensor to determine rainfall rates and cloud heights from a satellite. How research contributes - the usefulness of an active satellite radar system to make meteorological measurements will be determined.

The approach is to review rainfall and cloud attenuation and reflectivity measurements from ground based radars to determine suitable radar frequencies and then to determine a suitable design for a satellite radar. This portion of the study will be theoretical however. In all probability high altitude airborne measurements will be necessary before a system is flown in any satellite.

Supporting agency address information: AF Cambridge Research Laboratories LZ, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0020, DMSP IMAGERY INFORMATION EXTRACTION
R.S. HAWKINS, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF246120)

AF function - weather observing, analysis and forecasting military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objective - development of improved techniques to facilitate real time processing of satellite imagery. How development contributes - makes possible the real-time use of high- resolution satellite imagery in operational analysis and forecasting.

The first step is an evaluation of the preliminary mathematical techniques being tried at AFGWC to reduce and filter the very high resolution imagery, including a study of simple alternate approaches. The next step is intensive application of automated procedures to one or two specific applications, followed by an objective evaluation.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0021, SURFACE OBSERVATION AUTOMATION
W.S. HERING, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243800)

AF function - local airfield and missile base operations. Opportunity - provide more accurate and timely weather observations at reasonable operating cost. Objective - develop and evaluate weather sensors as required to assist the air weather service in the changeover from manual to automated methods of surface weather observing. How development contributes - field experiments are designed to develop and identify observing techniques that offer the greatest potential for effective automated measurement of significant local weather elements.

Direct evaluation of sensor performance characteristics will be made through the establishment of a prototype automated observing system for operational test purposes. Development will center on those elements where satisfactory solutions for automation do not exist. Included are evaluations of sensors for runway visual range, prevailing visibility, slant visual range, ceiling and sky cover.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, TYPHOON INVESTIGATIONS
T.J. KEEGAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF246080)

AF function - weather observing, analysis and forecasting for military operation. Deficiency - lack of adequate information to meet military support requirements. Objective - to develop techniques and equipment to more fully exploit meteorological satellite data for typhoon analysis and forecasting. How development contributes - allows substitution of satellite observations for reconnaissance flights in typhoon analysis and forecasting.

Satellite imagery will be examined to determine its utility in defining the location, intensity, wind field and future movement of tropical cyclones. Initially, a subjective approach will be taken by comparing cloud features to wind fields. As the MCIDAS system is broken in, it will be used to provide more objective descriptions of the cloud and wind fields in and around the storm system. Investigations of the potential of satellite data as input to dynamical forecasting techniques will be carried out simultaneously.

Supporting agency address information: AF Cambridge Research Laboratories Ly, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0023, ATMOSPHERIC EMISSION FROM THE AURORAL ZONE
E.V. LOEWENSTEIN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244200)

AF function - surveillance, detection, reconnaissance. Deficiency - infrared emission from the upper atmosphere interferes with detection and discrimination systems. Fluctuations in the emission from far northern latitudes can produce false signals and a masking background for cold-body detection system.

Altitude measurement will be made by triangulation-correlation experiment using two radiometers, one on a balloon, the other on a high- flying aircraft. A rocket-borne observation will be made from a payload above the enhanced layer, looking downward. Mapping will be accomplished by flying two radiometers on one vehicle (aircraft or balloon), one of which will point in a fixed direction while the other scans the sky. Spectral data will come from an interferometer-spectrometer that will be flown on separate flights. How research contributes - measures time variation, altitude of origin, and spatial and spectral distribution of the enhanced emission.

Supporting agency address information: AF Cambridge Research Laboratories OP, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0024, AURORAL IONSOPHERE SPECIFICATION
C.P. PIKE, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF246060)

AF function - satellite and transpolar communications, radar and navigation. Deficiency - the auroral ionosphere is presently very unpredictable to such a degree that the above functions are frequently degraded or crippled. Objective - to relate ionospheric/magnetospheric parameters to defense meteorological satellite program (DMSP) auroral photos to improve the accuracy of specifying and predicting substorm conditions. To develop an ionospheric F layer trough model. To incorporate the first two results into a mapping scheme. How research contributes - the high latitude ionospheric environment affects AF ground, airborne and satellite communications, radar and navigation systems. The short-range contribution is better specification of ionospheric parameters for AWS and its customers, OTH radar SPO's communication satellite, SPO's survivable communications, DMSP and GPS. The long-range contribution will be to assist the complete theoretical understanding of the complex magnetospheric interactions, ultimately necessary for reliable operation of the above functions.

The DMSP auroral photos are calibrated in terms of ionospheric parameters. Series of calibrated auroral photos depicting substorm development and decay are catalogued. Real-time auroral photos are compared to the catalogued calibrated photo series, providing real-time specification and prediction of the auroral ionosphere. The DMSP auroral photos are correlated with simultaneous ground-based observations of the F-layer trough to develop analytical expressions which specify the gradient in the F-layer trough. Techniques are to be developed to incorporate these inferred ionospheric parameters, which are available on a semi-hemispheric scale, into existing AFCRL mapping programs.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0025, SNOW/CLOUD DISCRIMINATION
F.R. VALOVCIN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF246110)

AF function - weather observing, analysis and forecasting for military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objective - to recommend operational techniques and equipment to discriminate clouds from snow fields. How development contributes - provides an efficient and unambiguous operational procedure for distinguishing clouds over snow and ice.

Laboratory studies and a few Skylab pictures indicate that data from an additional DMSP sensor around 1.55 microns would simply and objectively discriminate between clouds and snow fields. Additional Skylab analyses and possibly a few aircraft flights will be required to provide the technical data for the construction and flight of an operational sensor.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0026, DESIGN OF SOUNDING ROCKET PAYLOADS
M.J. DAVIN, Wentworth Institute, Undergraduate School, *Boston, Massachusetts* 02115 (DF245940; F19628-73-C-0232)

AF function - reconnaissance, surveillance and communications. Deficiency - inability to forecast atmospheric interactions affecting the design and operation of military systems such as reentry vehicles, over-the-horizon radars and satellites. Research - to increase ability to forecast atmospheric variables requires measurements by sounding rocket and satellite payloads. How research contributes - provides payloads for the conducting of experiments measuring those aerospace parameters of importance to AF systems operations. Research, development, and test of components and assemblies are undertaken to create reliable operating payloads for rocket and satellite probes. By the experimental nature of the work, these are primarily one-of-a-kind assemblies.

Supporting agency address information: AF Cambridge Research Laboratories LC, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0027, 118 GHZ RADIOMETER
D.H. STAELIN, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DF245370; F19628-75-C-0122)

AF function - weather analysis and forecasting for military operations. Deficiency - inability to determine meteorological conditions over inaccessible or unfriendly territory. Objective - to develop new and advanced equipment and techniques to better utilize the microwave vertical probing capability of the defense meteorological satellite system (DMSS). How development contributes - improves the ability to infer and forecast atmospheric temperature profiles and determines both qualitative and quantitative limits of probing cloud structure. This will allow determination of whether or not 100-200 GHz equipment should be flown on DMSS in the 1980 time frame, and the necessary and optimum processing of satellite data.

A receiver will be constructed utilizing a solid state mixer diode for switching and a frequency-locked klystron serving as a local- oscillator.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0028, DETECTION OF LEAF BLIGHT OF CORN BY REMOTE SENSING
G.R. SAFIR, Michigan State University, Agricultural Experiment Sta., *East Lansing, Michigan* 48823 (0059700; MICL01077)

OBJECTIVE: Determine if, by remote sensing, it is possible to detect early stages of infection by Helminthosporium maydis, distinguish disease produced by H. maydis from diseases produced by other organisms, and detect differences in resistance between different lines of corn or in segregating populations.

APPROACH: Many different lines of corn will be grown in the greenhouse and inoculated with H. maydis, H. turcicum, Kabatiella zeae, and Phyllosticta sp. and examined daily with remote sensing equipment. The effect of inoculation methods, resistance, and date after inoculation on the remote sensing data obtained will be determined. Similar experiments will be also performed under field conditions.

PROGRESS: The infrared fluorescence characteristics of corn leaves inoculated with Helminthosporium maydis were compared with those of healthy corn leaves in order to determine the potential for disease detection by a laser scanning remote sensing

system. The fluorescence characteristics of diseased leaves were different from those of healthy leaves, however, the usefulness of these differences has not yet been established. A mathematical directional reflectance model was used to determine the theoretical detectability of a wheat disease caused by wheat spindle streak mosaic virus. The model used enables one to predict the remotely sensed effect from a knowledge of the fundamental biological causes, which are both spectral and geometrical in nature. It was determined that relatively low levels of spindle streak mosaic disease should be detectable with infrared photography or an optical multispectral scanner. Analysis of satellite imagery (ERTS-1 and SKYLAB) for potential use in plant disease detection is underway.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0029, SATELLITE DATA RELAY PROJECT
R.W. PAULSON, U.S. Dept. of the Interior, Geological Survey, *St. Louis, Missouri* (PA 70-047)

There is an increasing demand for data collection in a near real- time mode. In order to satisfy the anticipated telemetry demands of the future the USGS must develop an effective method of large scale data collection in near real-time. The Earth Resources Technology Satellite series will include a near-real time data collection system which has the potential of being an operational and cost effective method of this type of data collection. Many future satellites will have data collection systems and their use by the WRD must be coordinated.

The objective of this project is to test the ERTS data collection system for applicability and reliability in collecting hydrologic data. Additionally, near real-time data will be tested for applicability in interpretation of space acquired remote sensing data. Follow on experiments with subsequent satellite data relay systems will be conducted.

A number of experiments with the ERTS data collection system will be developed nationwide to determine its operational problems and solutions to those problems. Experiments will be developed to test the system in different environments, for different disciplines, and for different purposes of data use.

ERTS-DCP's were installed in WRD districts in Alaska, Minnesota, Colorado, Montana, and will be installed in an additional 8 districts. ERTS DCP memory units were produced (21) and begun to be tested. Interrogatable GOES DCP's are to be shipped to the survey at the end of FY74. The convertible DCP design was finalized. An iterim GOES DCP data handling system was negotiated with the NESS.

The ERTS DCS experiment will be continued and six GOES-DCS experiments will be begun. Close liaison with the EROS program, NOAA, NASA, and the Corps of Engineers will continue.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0030, GAS-PHASE REACTIONS OF ATOMS, IONS, AND MOLECULES RELATED TO UPPER ATMOSPHERE CHEMISTRY
L.F. PHILLIPS, Univ. of Canterbury, *Christchurch, New Zealand* (DF031900; AF-AFOSR-2134-71)

Air Force operations in communications, detection, and propulsion are influenced by chemical processes occurring in the upper atmosphere. Precise knowledge of these processes and the chemical species present will assist prediction of the influence of possible perturbations of the upper atmosphere on potential AF operations. This research seeks knowledge of the type required with laboratory studies of related problems in photochemistry, chemical kinetics, and spectroscopy. One aspect emphasizes atom-molecule and ion-molecule reactions in fast-flow systems using mass spectrometers to monitor reagent concentrations. A second aspect emphasizes spectroscopy, photolysis, and luminescence. Reactions of energetically excited atoms and molecules are investigated with the aid of a modulated light source for activation. A third component of the research considers high temperature reactions and equilibria in flames. Specifically considered are the reactions of trace flame additives which produce emission spectra useful in determining steady-state concentrations of flame reaction intermediates. The experimental aspects of the research are assisted by complementary quantum calculations of the energetic, structural, and kinetic properties of selected reaction intermediates.

Supporting agency address information: AF Office of Scientific Research NC, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0031, ATMOSPHERIC INFLUENCES ON ECOSYSTEMS AND SATELLITE SENSING (PHENOLOGY)
G.R. NOGGLE, Univ. of North Carolina, Agricultural Experiment Sta., *Raleigh, North Carolina* 27600 (0059140; NC01969)

OBJECTIVE: Study the influence of climate on the growth and development of plants (native, horticultural, and agronomic) in North Carolina. The interactions of soil type, nutrition, and management practices with climate also will be studied.

APPROACH: Several horticultural cultivars (Persian lilac, Syringa persica; honeysuckle, Lonicera tatarica cv 'Arnold Red'; Lonicera KorolKowi cv 'Zabeli') will be established at N. C. Agricultural Research Stations. Other plants such as dogwood and red bud also will be planted, and a search will be made for other appropriate plants. Observations will be made on phenological events such as bud break, first leaf appearance, flowering, leaf coloration, and leaf drop. Weather data will be recorded throughout the growing season.

PROGRESS: The NC Phenology Network now has 20 stations where both Persian lilac and Zabelii honeysuckle are planted. During the Spring we were able to obtain dates for leaf emergence and flowering at 8 sites. We have identified an additional 10 locations where plants will be put out during the winter. Lilac is a marginal grower in most of NC and we are testing several other woody shrubs for the Network. We cooperated with the Regional NE-69 project in getting ground photographs at Raleigh and Ashville to coordinate with the ERTS-1 satellite pictures. A series of 12 ground shots from 20 locations were taken at 6-day intervals during the fall of 1972 as the leaves of deciduous trees became senescent and again during the spring of 1973 as the deciduous trees resumed growth. Our ground shots included deciduous trees, pastures, orchards, winter wheat, sorghum, and soybeans.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0032, SPECTROSCOPIC MEASUREMENTS OF OZONE, WATER VAPOR, AND OTHER ATMOSPHERIC GASES
K.N. RAO, Ohio State University, Graduate School, *Columbus, Ohio* 43210 (9-114; 04-4-158-30)

Objective: To improve the accuracy of spectroscopic parameters used in atmospheric transmittance calculations. Atmospheric transmittances are necessary for the retrieval of vertical temprature profiles from the spectral radiance data obtained by satellite vertical sounding instruments. Extent values of the spectroscopic parameters have been demonstrated to be too crude to meet the quantitative accuracy requirements of the sounding program.

Approach: The spectral absorption of lines and/or bands of ozone and water vapor will be measured in the laboratory in those spectral regions which affect the measurement channels of the vertical sounding instruments--primarily from 12-20 micron m. Spectroscopic parameters-- line position, line strength and width--will be deduced by existingmethods. For ozone, spectral absorption will be measured at high resolution in the nu2, nu3 bands and an attempt made to perform measurements in the nu1 band. Interpretative aspects of these measurements will be completed during the current funding period. The spectral absorption of water vapor and water vapor-nitrogen mixtures will be measured at lower resolution (approximately 0.2 cm minus 1) with emphasis on the contributions to absorption caused by the continuum and the wings of distant lines. Spectroscopic measurements will be initiated on the 15 micron m CO2 bands in conjunction with NOAA/NESS. After an initial band mapping, emphasis will on band intensity and line parameters on those lines amenable to measurement.

Progress: Ozone - Measurements on nu3 band and structural analysis has been completed. Measurements on nu2 band almost complete but not yet analyzed. H2O - Preliminary measurements at high resolution with a one meter path cell have been made in the rotational region.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0033, A PROPOSAL TO CONDUCT LASER RADAR RESEARCH FOR MEASURING ATMOSPHERIC TEMPERATURE PROFILES 12835-GS

J.A. COONEY, Drexel University, School of Science, *Philadelphia, Pennsylvania* 19104 (DA0G5570; DAHC04-75-G-0101)

The research seeks to determine in detail the feasibility of measurement of vertical temperature profiles in the atmosphere using a ruby laser and monitoring two separate portions of the Raman rotational backscatter of N sub 2 and O sub 2 from altitudes up to 4-5 km. A program of signal enhancement will also be undertaken involving spectroscopic studies of the O sub 2 line at 7600A. Relevance - accurate and real-time sensing of temperature as a function of altitude has many areas of military interest. Knowledge of atmospheric temperature profiles is important to artillery accuracy--in the propagation of a laser beam--and in the transport and diffusion of CB agents. Because of this importance the research fits directly into the automated meteorological system being developed by the Army.

The work involves the design and construction of a dual channel laser radar. After extensive testing and calibration of all subassemblies in the laboratory, temperature profiles will be acquired in the field and compared with profiles obtained by other methods.

Supporting agency address information: AMC Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0034, BIOLOGY, ECOLOGY, AND CONTROL OF THE IMPORTED FIRE ANT IN TEXAS

R.L. HARRIS, U.S. Dept. of Agriculture, Vet. Toxicology Research Lab., *College Station, Texas* 77843 (0022790; 7302-15490-003)

OBJECTIVE: Determine the specific biology, ecology, and environmental relationships of the imported fire ant under southeast and east Texas conditions. Develop ground and remote sensing techniques applicable to Texas conditions that can be used as survey tools.

APPROACH: Routine ecological and entomological field techniques will be used to observe the activities and interactions of the fire ant with other plant and animal forms. Attempts will be made to develop an air-photo technique as well as novel ground-oriented survey techniques.

PROGRESS: The optimum altitude for the detection of the imported fire ant (IFA) mounds in Texas coastal plains pastureland by a modified K-37 infrared camera system ranges between 2000 and 3000 feet above ground level. The optimum season for IFA mound detection is from late fall (November-December) to early spring (March-April). Black-White infrared (BWIR) film and color infrared (CIR) film are comparable in the ability to detect IFA during the optimum season. CIR film is better able to detect mounds during other times of the year. Mound size and vegetable cover directly affect the ability of the camera system to detect mounds. Studies show that there is a great deal of cross-communication between imported fire ant mounds, and the amount of interaction is seasonal. Mirex residues were found in six species of ants after a treatment at 1.25 lb of bait/acre.

SUPPORTED BY U.S. Dept. of Agriculture - A.R.S. - O.T.A

5.0035, REMOTE SENSING FOR SPECTRAL ANALYSIS OF SOIL AND WATER CONDITIONS AND PROBLEMS

C.L. WIEGAND, U.S. Dept. of Agriculture, Agricultural Research Service, *Weslaco, Texas* 78596 (0040968; 7202-12370-001)

OBJECTIVE: Develop fundamental information on the reflectance and emission characteristics of plants and soils, and test small data batches from electronic and optical mechanical systems aboard aircraft and spacecraft for detecting and assessing agricultural problem conditions.

APPROACH: Analyze seasonal changes of crops, discriminate among them, and estimate the acreages of selected crops in Hidalgo County using the Earth Resources Technology Satellite (ERTS) 4-channel scanner digital magnetic tape data. Determine whether differences in chlorophyll concentration in grain sorghum can be detected in ERTS data. Compare ERTS near-infrared reflectance with ground observations of leaf area index (LAI) and with predictions of an analytical model for determining plant vigor (cropland) and animal carrying capacity (rangeland). Complete study on optimal film types for soil mapping. Determine the influence of leaf maturation on reflectance of radiation over the 2.5- to 40-mum wavelength interval. Investigate procedures required to map saline soils by use of SKYLAB multispectral and photographic data.

SUPPORTED BY U.S. Dept. of Agriculture - A.R.S. - S.T.A

5.0036, STUDIES OF THE ATMOSPHERE USING AEROSPACE PROBES

V.E. SUOMI, Univ. of Wisconsin, Space Science & Engr. Center, *Madison, Wisconsin* 53706 (8-012; 04-3-158-61)

Objectives: To develop improved applications of satellite, remotely-sensed data to: (1) measure surface heating and surface-to- boundary layer heat transfer at the mesoscale level; (2) identify potentially threatening (severe storm) patterns from cloud development studies on a short-term (i.e., high resolution temporally) basis; (3) study a variety of sub-synoptic meteorological features such as squall lines, jet streams and large scale gravity waves.

Approach: SMS/GOES, ITOS and Nimbus data (as available) will be examined on a case-by-case basis and related to data from the observational network in order to identify those with high correlation to the phenomena of interest (i.e., heating, heat transfer, squall lines, jet streams, etc.).

Progress: Distinct relationships have been established unde effort supported in the past by NESS in: (1) relating cloud motio to wind fields; (2) relating cloud dynamics to severe storm development; (3) relating cloud dynamics to variable surface heating. In the first case, that of relating cloud motion to winc fields, the application has advanced to the point where it is operationally utilized by NESS daily.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, MEASUREMENT OF PILOT DISCRIMINATION OF SIMULATED MOTION IN SELECTED UPT MANEUVERS

E.E. EDDOWES, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222010)

To describe the pilot's discrimination between simulated motion conditions as generated by the ASUPT motion system and G-seat during the performance of selected UPT maneuvers.

The simulated motion conditions to be studied will be generated using ASUPT with the full capability visual simulation integrated with the motion simulation. The six degree-of-freedom motion condition will be the standard condition against which other motion conditions will be compared. A two-alternative, forced-choice procedure and standard theory of signal detection analyses will be used to define pilot motion discrimination performance.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0002, DEVELOPMENT OF ASUPT AS A CRITERION SYSTEM

T.H. GRAY, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222100)

The objectives of this study are to verify the 'performance equivalence' methodology as a useful technique for establishing simulator fidelity, and to establish ASUPT as a criterion system for training research.

An identical flight profile using the same experienced pilot will be flown in ASUPT and T-37 instrumented aircraft 948. This procedure will be replicated with five pilots. Measures of pilot and system outputs will be taken using performance measurement concepts discussed in WAAG, 1974. The simulator will be con-

sidered 'performance equivalent' when no significant differences exist between subjects inputs into the two systems while system outputs are the same.

Supporting agency address information: AF Human Resources Laboratory FTS, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0003, DEVELOPMENT AND EVALUATION OF SIMPLIFIED INSTRUCTIONS FOR THE ACQUISITION OF THE NORMAL LANDING SKILLS

E.L. MARTIN, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222030)

1. To develop instructional syllabi for application to simulator training of the normal landing, 2. To evaluate the effects of simplified instruction of the normal landing on the acquisition of landing performance by UPT student pilots, and 3. To assess the contribution of various advanced training provisions.

UPT student pilots will be trained in ASUPT on the normal overhead landing under one of four conditions, three types of instructions based on the simplification of the maneuver and an adapted standard ATC procedure. Experimental syllabi will be developed comparing the following methods of task simplification- (1) Dividing the maneuver into segments and (2) Sequential addition of aircraft control parameters. The effects of the training conditions will be evaluated by learning efficiency in ASUPT and transfer to the aircraft.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0004, FORMATION FLYING SKILL ACQUISITION

G.B. REID, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222120)

To investigate instructional techniques, sequencing and quantity of practice for the most effective integration of the formation flight trainer into undergraduate pilot training.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0005, A STUDY OF ASUPT PREPROGROGRAMMABLE FLIGHT DEMONSTRATION CAPABILITIES

D.M. TYLER, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222050)

To compare and evaluate the instructional potential of the advanced instructional provisions (AIP) available on ASUPT and to define the optimal use of instructor pilots in conjunction with AIP.

UPT preflight casual students at WAFB will be trained in ASUPT on standard ATC maneuvers under one of three experimental syllabi comparing the conventional student-IP instructional techniques with ASUPT's preprogrammable maneuver demonstrations. The students will be required to meet IP established criteria recorded by the advanced instructional provisions performance measurement feature of ASUPT.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0006, DEVELOPMENT AND EVALUATION OF PERFORMANCE MEASURES FOR TAC COMBAT CREW TRAINING

W.L. WAAG, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222000)

The development of a performance measurement system to be used in evaluation of the training effectiveness for TAC ground based simulator training systems. Primary areas of concern will be the development of objective measurements for- (1) takeoffs and landings, (2) air-to-ground weapons delivery, (3) air-to-air combat maneuvering, (4) instruments, and (5) navigation maneuvers. It is anticipated that the resulting measurement system would be an adjunct to the present training program as well as a tool for use in planned research evaluations of these training devices. A further objective is the development of an empirical data base reflecting performance standards of both experienced F-4 instructor pilots and students as they progress through F-4 training programs.

A criterion-referenced approach to pilot performance measurement has been utilized in measurement system development for ASUPT and shown to be highly effective. The development of the measurement system for each training area will require four phases- (1) definition of the criterion objectives for each task in terms of a potential set of simulator parameters, (2) evaluation of the proposed set of measures for the purpose of validation and simplification, (3) definition of criterion performance by requiring experienced combat crews to fly the task in question, and (4) collection of normative data using students as they progress through the simulator training program.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0007, SIMULATION DESIGN CONFIGURATIONS STUDY 1 (MOTION, G-SEAT, VISION)

B.K. WATERS, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222060)

To assess differential effects between the motion, G-seat and visual factors upon performance of experienced pilots in ASUPT. To acquire information on the effectiveness of selected system output measures in the measurement of pilot performance in asupt.

A three factor experimental design (3 x 2 x 2) will be utilized with three levels of the motion variable (no motion, full 6-degree-of- 6-degree-of-freedom motion, and 3 degree-of-freedom) (roll, pitch, and heave) motion two levels of G-seat (off and on), and two levels of visual field of view (FOV). Six experienced pilot-subjects will fly 72 randomly ordered ASUPT missions on ten specified flight maneuvers. Subjective flight evaluation data will be correlated with automated performance measurement data to provide information on the effectiveness of the selected measures.

Supporting agency address information: AF Human Resources Laboratory FTS, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0008, STOCHASTIC PROCESSES IN BIOMECHANICS

Y.K. LIN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

Modeling the time varying loading on a tri-cuspid prosthetic aortic valve as a random process, the average fatigue damage per unit time is evaluated using the theory of random vibration. The reciprocal of this average damage rate is then a measure of fatigue life. The information is useful in designing artificial heart valves. This problem is part of a broader project in which new applications of the theory of stochastic processes to biomechanics are investigated.

SUPPORTED BY University of Illinois

6.0009, DYNAMICS OF A MOVING ASTRONAUT

W.T. FOWLER, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: In the past, human body models have been developed by assuming simple geometric shapes for the components of the human body in order to predict the mass properties, i.e. mass, center of mass, and inertia tensor. In this study a new personalized method of predicting component mass properties is being developed, based on experimental data for whole-body mass properties for three body positions where only one component is moved. Also needed, however, are estimates for the mass and sum of the moments of inertia of each component.

Additionally, the contribution of outer garments or a suit to the mass properties can be included in the prediction if it is assumed that the components of the outer covering are rigid bodies that move negligible relative to corresponding body components. The inertia-mass properties found in the first stage of the research

will be used in a dynamic model of a moving astronaut during extra-vehicular activity.

SUPPORTED BY University of Texas

6.0010, DEVELOPMENT OF ADVANCED G-SUITS/G-VALVES FOR ADVANCED AIRCRAFT SYSTEMS

R.R. BURTON, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF318690)

To develop and test new concepts in G-suits and G-valves in order to enhance aircrew capability in new generation fighter-attack aircraft which have high G performance characteristics--the ability to rapidly develop and maintain high G in level flight.

Anti-G suit concepts and valve concepts will be examined originally as separate units. Anti-G suits will be evaluated at high plus GZ levels examining the specific value of abdominal and leg support. Appropriate modifications to the standard anti-G suit will be undertaken. Three types of experimental (variable) anti-G valves will be developed which have the capability of varying the pressurization schedule of the anti-G suit- (a) mechanical, (b) electronic, and (c) fluidic. After determining (separately) the best suit and valve concept they will be combined to evaluate their anti-G effect at high levels of plus GZ, including simulated air-combat maneuvering.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0011, BEHAVIORAL, PSYCHOLOGICAL AND PSYCHOMETRIC CHARACTERISTICS OF USAF AIRCREW MEMBERS

J.K. PHILLIPS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF319540)

To detemine current normative behavioral patterns and performance on psychometric instruments. To explore the relationship between these parameters and other physiological and behavioral data, for aircrew members. The purpose of the effort is to define empirically the unique psychological aspects of the population of flying personnel and how various specially selected groups differ from other aircrew on routine status. This is expected to refine both the initial selection and continued maintenance of aircrew at a high proficiency level, both for routine operations and special projects.

Behavioral, psychometric and/or interview data will be collected from flying personnel in all rated categories, some of which personnel will be SAM patients, some nonpatients in operational flying jobs, and some who, by virtue of unique experiences as aviators, form distinct subgroups within the flying population. These data will be combined with demographic and laboratory physiologic data when appropriate, and submitted to statistical analysis to determine the type, strength, and uniqueness of reliable relationships among the data. These relationships will be clarified and refined in the course of continuing studies. The program of research will eventuate in a reliable, valid set of relationships and empirical norms useful in conceptualizing and solving the problems of active aviators. New measures and norms more appropriate than those currently available for evaluation, description, and training of aircrew are expected to result from this work.

Supporting agency address information: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0012, STUDY OF HUMAN BEHAVIOR IN PILOT VEHICLE SYSTEMS

P.H. WEWERINKE, Natl. Aerospace Laboratory, *Amsterdam, the Netherlands* (DF289410; AF-AFOSR-2845-75)

AF function - pilot modeling techniques. Deficiency - inability to mathematically represent a pilot performing flight maneuvers. Research - human modeling techniques will be utilized to design a 'paper pilot' capable of performing simple tasks. Laboratory research and field trials will be conducted to measure physiological quantities for comparison with pilot model. Information will be exchanged with USAF counterparts. How research contributes - the proposed exchange of information will enable USAF researchers to incorporate heretofore unobtainable information into their pilot models and utilize techniques developed by NLR.

Supporting agency address information: European Ofc of Aerospace Rsch and Dvlpmt NRE, Box 14, FPO New York, N.Y. 09510

SUPPORTED BY U.S. Dept. of Defense - Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, MODEL STRUCTURE DETERMINATION AND VERIFICATION

E. TSE, Stanford University, School of Engineering, *Palo Alto, California* 94305 (DN575179; N00014-75-C-0738)

The complexity of modern naval systems such as high performance aircraft, submarines, etc., and the techniques developed recently for identification of system parameters require new techniques for mathematically modelling systems. The objective of this effort is to develop methods for mathematically modelling modern Navy systems for the purpose of improved simulation, design and control. Both model structure determination and optimal input design will be considered with the goal of providing methodology for practicing naval engineers.

This effort will consider problems of model structure determination, identifiability and uniqueness, and optimal input design. In particular, the work will include the derivation of an objective validation test for determining the structure of multivariable stochastic linear systems, an investigation of an on-line updating method for estimation of the parameters of linear systems and the development of a new formulation for closed-loop system identification.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

7.0002, APPLICATION OF MODERN COMPUTING TECHNIQUES TO AIRCRAFT SIMULATORS

W.J. KUBITZ, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

An investigation into the use of modern computing techniques for general aviation simulator/trainers. The use of special purpose machines for arithmetic and function generation was considered. An overall design evolved for a microprogrammable, bus oriented, distributed system. A specific design for a portion of the radio aids subsystem evolved.

SUPPORTED BY University of Illinois

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, COMPREHENSIVE ANALYSIS OF CARBONACEOUS CHONDRITES

K. FREDRIKSSON, Smithsonian Institution, *Washington, District of Columbia* 20560 (3350-04)

Orgueil and possibly other carbonaceous meteorites will be separated chemically and mechanically. Mineralogical, chemical and organic composition of each fraction will be determined by various techniques in different laboratories. An exceptionally clean 25 gram sample of Orgueil has been obtained for this project.

SUPPORTED BY Smithsonian Institution

10.0002, SOLAR WIND ANALYSIS

H.S. BRIDGES, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (DF245450; F19628-75-C-0131)

AF function - communications, surveillance and satellite operations. Deficiency - incomplete knowledge of processes connecting solar phenomena with upper atmosphere and near-earth environment. Objective - define the prevailing processes and develop prediction schemes. How research contributes - relating solar wind and observed energetic particle fluxes observed by satellite with terrestrial and/or near earth operational problems leads to understanding of problems and ultimate solution.

Solar wind data from the satellites Solrad 11 will be obtained from the Naval Research Laboratories and compared with other Solrad data, particularly AFCRL proton sensors. These will be compared with each other and with observations from ground sources and other satellites. These results will contribute to our understanding of the phenomena.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0003, PETROLOGICAL & MINERALOGICAL STUDIES

J. WOOD, Smithsonian Institution, *Cambridge, Massachusetts* 02138 (31P-4P50-02)

Comprehensive studies are made of solid extraterrestrial material including returned lunar soil samples and meteorites by techniques of mineralogy and petrology; optical microscopy, X-ray diffraction, electron-probe microanalysis and scanning electron microscopy. Petrological studies lead to deductions about the origin and evolution of these materials.

SUPPORTED BY Smithsonian Institution

10.0004, UPDATE OF SPARES CODES

K.C. HOPKINS, Radiation Research Assoc. Inc., *Fort Worth, Texas* 76107 (DF185080; F29601-75-C-0096)

The objectives of this effort is to improve the computational physics and procedures in the SPARES (space radiation environment and shielding) codes. The improved SPARES codes will provide accurate, quick-running calculations for radiation doses behind various and complicated shielding distributions resulting from electron, proton, and bremsstrahlung radiations.

A more accurate method of computing build-up factors will be incorporated and the results compared with the tiger Monte Carlo code. Also, the latest natural electron environments will be inserted. A study of the feasibility of incorporating a magnetic storm model will also be done.

Supporting agency address information: AF Weapons Laboratory DYT, Kirtland AFB, N. Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0005, ULTRA-HIGH ENERGY COSMIC RAY INTERACTIONS

J.J. LORD, Univ. of Washington, School of Arts, *Seattle, Washington* 98105 (MPS73-08863 A02)

Professor Lord is studying high energy interactions with an emulsion spectrometer which has been exposed to the cosmic radiation at an altitude of 33 kilometers. Analyses of these data and data accumulated in the international collaboration, ICEF, will be made and compared with current theories of hadronic interactions in nuclei.

This work is a continuation of that currently supported by Foundation grant number GP-39011, amendment number one.

SUPPORTED BY U.S. Natl. Science Foundation

VOLUME 13 NUMBER 17 / SEPTEMBER 8, 1975

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

No abstracts in this category.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-25863 Georgia Inst. of Tech., Atlanta.
DYNAMIC STALL CHARACTERISTICS OF AN OSCILLATING AIRFOIL IN A HARMONICALLY VARYING FREESTREAM VELOCITY Ph.D. Thesis
John Bruce Malone 1974 184 p
Avail: Univ. Microfilms Order No. 75-13001

The unsteady freestream environment of a helicopter rotor blade in forward flight was simulated using a gust generator mechanism installed in a low-turbulence wind tunnel. A model is used for this investigation. An operational analog computer is used to obtain both the aerodynamic moment acting on the model, and the work done by the moment during pitching oscillations of the airfoil. The experimental tests indicate that the unsteady freestream can produce large changes in the shape of the aerodynamic moment versus angle of attack hysteresis loops. The test results also show that the stability of the system can be adversely affected by the unsteady freestream under certain parametric conditions. Dissert. Abstr.

N75-25864 Iowa Univ., Iowa City.
VISCID-INVISCID INTERACTION DUE TO THE THICK BOUNDARY LAYER NEAR THE TAIL OF A BODY OF REVOLUTION Ph.D. Thesis
Akihiko Nakayama 1974 99 p
Avail: Univ. Microfilms Order No. 75-13800

An iterative method of calculating the development of the thick turbulent boundary layer near the tail of a body of revolution is presented and the results of numerical calculations are compared with experimental data. The iterative method consists of the potential-flow calculation by a method of integral equation of the first kind and the calculation of the development of the boundary layer and the wake using an integral method with the condition that the velocity remains continuous across the edge of the boundary layer and the wake. The additional terms that appear in the momentum integral equation for the thick boundary layer and the near wake are taken into account and the pressure difference between the body surface and the edge of the boundary layer and the wake are determined. The results obtained by the present method are in good agreement with the experimental data. Dissert. Abstr.

N75-25865 Virginia Polytechnic Inst. and State Univ., Blacksburg.
INVESTIGATION OF THE TURBULENT PROPERTIES OF THE WAKE BEHIND SELF PROPELLED, AXISYMMETRIC BODIES Ph.D. Thesis
Ching-Chang Chieng 1974 125 p
Avail: Univ. Microfilms Order No. 75-11930

The turbulent wakes behind a streamlined drag body, a jet-propelled body and a propeller-driven body are studied experimentally in stability wind tunnel at a nominal free stream velocity of 206 ft/sec. The turbulence properties investigated are axial, radial, and tangential turbulence intensities and radial and tangential shear stresses. Data was taken at five axial stations downstream of the tail of the body: X/D = 2, 5, 10, 20 and 40. It is found that the propeller-driven body produces the largest wake throughout the axial distance covered by these tests. The jet-propelled body produces the middle sized wake compared to the other two models up to the station X/D = 20; beyond this station, this wake becomes the smallest. Dissert. Abstr.

N75-25866 Virginia Polytechnic Inst. and State Univ., Blacksburg.
TURBULENT WAKE BEHIND SLENDER BODIES, INCLUDING SELF-PROPELLED CONFIGURATIONS Ph.D. Thesis
Roy Charles Swanson, Jr. 1975 115 p
Avail: Univ. Microfilms Order No. 75-11950

The turbulent wakes behind a streamlined drag body, a jet-propelled body, and a propeller-driven body are studied experimentally in a subsonic wind tunnel at a principal nominal freestream velocity of 206 ft/sec. The wakes produced by the latter two bodies are momentumless. Mean flow data taken at five axial stations (X/D = 2, 5, 10, 20, and 40) downstream of the sterns of these bodies include velocity and static pressure distributions. The streamwise variation of the maximum values of axial turbulence intensity and radial shear stress are also presented. The mean flow data for the wake behind the drag body compare favorably with previous experiments and establish a rigid reference for the wakes behind slender, self-propelled configurations. Dissert. Abstr.

N75-25867 Stanford Univ., Calif.
POTENTIAL FLOW ABOUT THREE-DIMENSIONAL STREAMLINED LIFTING CONFIGURATIONS, WITH APPLICATION TO WINGS AND ROTORS Ph.D. Thesis
James Michael Summa 1975 158 p
Avail: Univ. Microfilms Order No. 75-13606

A numerical method is developed and successfully applied for converging to the exact calculation of three-dimensional lifting potential flows, including cases of unsteady motion. The exact body surface boundary conditions are enforced, and all wake surfaces are unconstrained. The assumptions made in the theoretical model are that the fluid is ideal and that no separation may take place. The basic solution consists of the Green's function approach, where the velocity potential at any point in the fluid is represented by continuous distribution of doublets of unknown strength on each of the bounding surfaces. Application of the surface tangency condition yields a set of coupled, singular

Fredholm integral equations of the first kind relating the velocity potential doublet distributions to the normal velocity on the body surfaces and subject to the Kutta-Joukowski condition at trailing edges and the dynamic and geometric surface conditions on all wakes. Dissert. Abstr.

N75-25868# National Aviation Facilities Experimental Center, Atlantic City, N.J.
THE MEASUREMENT OF THE BOEING 707 TRAILING VORTEX SYSTEM USING THE TOWER FLY-BY TECHNIQUE Final Report, Oct. - Nov. 1972
Leo Garodz, David Lawrence, and Nelson Miller Mar. 1975 124 p refs
(AD-A008384; FAA-NA-74-37; FAA-RD-75-15) Avail: NTIS HC $5.25 CSCL 01/1

The results are presented for a series of low-altitude flight tests in which the trailing vortices of the Boeing 707 airplane were investigated using a 140-foot tower instrumented with airspeed, velocity, direction, temperature, and humidity sensors. Flow visualization was employed and motion picture records made. The data presented consists of plots of vortex tangential velocity distribution, peak tangential velocity as a function of time, airplane configuration, windspeed, and airplane altitude in proximity to the tower, vortex descent rates, lateral transport velocities, and specimen time histories of the velocities measured by individual sensors. Author

N75-25869*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL CALCULATION OF TRANSONIC BOATTAIL FLOW
Wen L. Chow, Lawrence J. Bober, and Bernhard H. Anderson Washington Jun. 1975 22 p refs
(NASA-TN-D-7984; E-8065) Avail: NTIS HC $3.25 CSCL 01A

A viscid-inviscid interaction procedure for the calculation of subsonic and transonic flow over a boattail was developed. This method couples a finite-difference inviscid analysis with an integral boundary-layer technique. Results indicate that the effect of the boundary layer is as important as an accurate inviscid method for this type of flow. Theoretical results from the solution of the full transonic-potential equation, including boundary layer effects, agree well with the experimental pressure distribution for a boattail. Use of the small disturbance transonic potential equation yielded results that did not agree well with the experimental results even when boundary-layer effects were included in the calculations. Author

N75-25870*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPARISON OF MEASURED AND CALCULATED AIRCRAFT LIFT GENERATED PRESSURES
Donald S. Findley Jun. 1975 17 p refs
(NASA-TM-X-72707) Avail: NTIS HC $3.25 CSCL 01A

Lift generated pressures produced by large, heavy aircraft at low altitudes were investigated due to concern over their possible effects on ground objects. Aircraft lift generated pressures were calculated using elementary airfoil theory, and these values were compared with ground level measurements made during an overflight program. The predicted and the measured values were in relatively good agreement. Due to lack of experimental investigations of this phenomenon, opportunity was taken during an overflight program to use a specially instrumented test range to measure the ground pressures produced for a range of aircraft weights and distances. Author

N75-25871*# Boston Univ., Mass. Coll. of Engineering.
STEADY AND OSCILLATORY, SUBSONIC AND SUPERSONIC, AERODYNAMIC PRESSURE AND GENERALIZED FORCES FOR COMPLEX AIRCRAFT CONFIGURATIONS AND APPLICATIONS TO FLUTTER M.S. Thesis
Lee-Tzong Chen 1975 201 p refs
(Grant NGR-22-004-030)
(NASA-CR-142983) Avail: NTIS HC $7.25 CSCL 01A

A general method for analyzing aerodynamic flows around complex configurations is presented. By applying the Green function method, a linear integral equation relating the unknown, small perturbation potential on the surface of the body, to the known downwash is obtained. The surfaces of the aircraft, wake and diaphragm (if necessary) are divided into small quadrilateral elements which are approximated with hyperboloidal surfaces. The potential and its normal derivative are assumed to be constant within each element. This yields a set of linear algebraic equations and the coefficients are evaluated analytically. By using Gaussian elimination method, equations are solved for the potentials at the centroids of elements. The pressure coefficient is evaluated by the finite different method; the lift and moment coefficients are evaluated by numerical integration. Numerical results are presented, and applications to flutter are also included. Author

N75-25872*# Boston Univ., Mass. Dept. of Aerospace Engineering.
COMPRESSIBLE UNSTEADY POTENTIAL AERODYNAMIC FLOW AROUND LIFTING BODIES HAVING ARBITRARY SHAPES AND MOTIONS Semiannual Report, 1 Jan. - 30 Jun. 1975
Luigi Morino 30 Jun. 1975 13 p refs
(Grant NGR-22-004-030)
(NASA-CR-142979; SAR-7) Avail: NTIS HC $3.25 CSCL 01A

The program SUSSA ACTS, steady and unsteady subsonic and supersonic aerodynamics for aerospace complex transportation system, is presented. Fully unsteady aerodynamics is discussed first, followed by developments on normal wash, pressure distribution, generalized forces, supersonic formulation, numerical results, geometry preprocessor, the user manual, control surfaces, and first order formulation. The ILSWAR program was also discussed. Author

N75-25873*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND TUNNEL PRESSURE SIGNATURES FOR A 0.0041-SCALE MODEL OF THE SPACE SHUTTLE ORBITER
Joel P. Mendoza May 1975 69 p refs
(NASA-TM-X-62432; A-6067) Avail: NTIS HC $4.25 CSCL 01A

Pressure signatures for a 0.0041-scale model of a space shuttle orbiter were measured in a wind tunnel at Mach numbers from 1.30 to 3.02. The model was tested at 10 deg and 25 deg angle of attack and roll angles were varied from 0 deg to 180 deg in 30 deg increments. Comparisons of sonic boom levels were made for a delta wing configuration and for the space shuttle orbiter which were assumed to have identical lengths and entry trajectories. The sonic boom levels for the orbiter were slightly higher than those for the delta wing orbiter. An example is presented showing that the existing data base for the delta wing orbiter can be used to predict the ground level sonic booms for the orbiter. Author

N75-25874*# Mississippi State Univ., Mississippi State. Aerophysics and Aerospace Engineering.
NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR ARBITRARY TWO-DIMENSIONAL MULTI-ELEMENT AIRFOILS Semiannual Status Report, 1 Jan. - 30 Jun. 1975
Joe F. Thompson 1 Jul. 1975 8 p
(Grant NGR-25-001-055)
(NASA-CR-143038) Avail: NTIS HC $3.25 CSCL 01A

Abstracts are presented on a method of numerical solution of the Navier-Stokes equation for the flow about arbitrary airfoils, using a numerically generated curvilinear coordinate system having a coordinate line coincident with the body contour. Results of continuing research are reported and include: application of the Navier-Stokes solution in the vorticity-stream function formulation to a number of single airfoils at Reynolds numbers up to 2000: programming of the Navier-Stokes solution for multiple airfoils in the primitive variable formulation; testing of the potential flow solution of multiple bodies; and development of a generalized coordinate system program. L.B.

N75-25875# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
AERODYNAMIC EFFECTS OF VORTEX SUPPRESSORS
H. Portnoy Jul. 1974 20 p refs
(Grant AF-AFOSR-2145-71; AF Proj. 6813; AF Proj. 9781)
(AD-A003750; TAE-221; AFOSR-75-0013TR; SR-4) Avail: NTIS CSCL 01/1

The effectiveness of various devices in accelarating the dissipation of wing-tip vortices has received considerable attention recently. These devices include jets blown into or near the vortex core, both in the upstream and downstream direction, small cruciform wings, both fixed and rotating, mounted close behind the wing near tip and angled fences or vortex generators mounted on the wing upper and lower surfaces so as to produce swirl opposite to that of the tip vortex. In this report are proposed mathematical models for representing some of these devices in order to calculate their effects on the wing aerodynamic properties. These models are incorporated into a lifting-line theory and examples are calculated for high-aspect-ratio, unswept, untwisted wings of the elliptic planform. In order to obtain results of a more useful kind, it is suggested that these models be used with a lifting-surface theory of the vortex-lattice type. GRA

N75-25876# ARO, Inc., Arnold Air Force Station, Tenn.
BOUNDARY-LAYER TRANSITION ON CONES NEAR MACH ONE IN AN AEROBALLISTIC RANGE Final Report, 1 Jul. 1973 - 30 Jun. 1974
J. Leith Potter AEDC Jan. 1975 31 p refs Sponsored by AF
(AD-A003493; ARO-VKF-TR-74-91; AEDC-TR-74-115) Avail: NTIS CSCL 19/1

The feasibility of determining Reynolds numbers of boundary layer transition on sharp, 10-deg, semiangle cones at slightly supersonic free-stream Mach numbers in an aeroballistic range is demonstrated. Some problems relating to the experimental technique are discussed, and the data are compared with results for higher Mach numbers. Possibly important differences between transonic wind tunnels and the aeroballistic range are pointed out in connection with a warning about comparing transition data from different facilities. GRA

N75-25877# Flow Research, Inc., Kent, Wash.
BOUNDARY LAYER TRANSITION ON BLUNT BODIES Scientific Report, 15 Jan. - 14 Jul. 1974
Denny R. S. Ko, Charles L. Merkle, and Toshi Kubota Oct. 1974 8 p refs
(Contract F44620-74-C-0049; AF Proj. 4730A)
(AD-A004826; AFOSR-75-0191TR) Avail: NTIS CSCL 16/2

The results of linear stability theory have been used to predict the location of boundary-layer transition, with emphasis on including the effects of surface roughness and axisymmetric geometry. Both of these parameters are important in determining transition on re-entry vehicles. The effects of surface roughness were included by means of a turbulent sublayer model which attributes the effects of roughness to an alteration in the mean velocity profile. Axisymmetric effects were included by a proper consideration of the growth rate of the boundary-layer thickness. GRA

N75-25878# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
ARTIFICIAL ICING TESTS CH-47C HELICOPTER Final Report, 8 Apr. - 2 May 1974
Carl F. Mittag, James C. OConnor, and Louis Kronenberger, Jr. Aug. 1974 71 p
(AD-A004008; USAAEFA-73-04-1) Avail: NTIS CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a limited evaluation of the CH-47C helicopter in artificial icing conditions from 8 April 1974 through 2 May 1974. These tests were conducted at Moses Lake, Washington, and consisted of 2.9 hours in an artificial icing environment. Artificial icing tests were conducted to evaluate the capability of the CH-47C helicopter to safely operate in an icing environment and to verify the icing limitations presented in the operator's manual. Additionally, the capabilities of the standard anti-ice systems and installed special equipment were evaluated. GRA

N75-25879# Naval Postgraduate School, Monterey, Calif.
AERODYNAMIC CHARACTERISTICS OF AN AXISYMMETRIC BODY UNDERGOING A UNIFORM PITCHING MOTION Ph.D. Thesis
Lloyd Henry Smith Dec. 1974 99 p refs
(AD-A003859) Avail: NTIS CSCL 16/2

An experimental investigation was conducted to determine the effect of a uniform pitching motion on a slender axisymmetric body while undergoing large excursions in angle of attack. Force and moment measurements were obtained for a slender tangent-ogive/cylindrical body over a range of Reynolds numbers from 50,000 to 140,000 while varying the angle of attack from zero to 90 degrees and the pitch rate between zero and 281 degrees per second. Smoke flow visualization studies were used as an aid in assessing wake vortex transitions. GRA

N75-25880# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
SHOCK-WAVE INTERACTION WITH TWO-DIMENSIONAL BODIES Final Report, 1972 - 1973
John W. Murdock 6 Dec. 1974 49 p
(Contract F04701-74-C-0075)
(AD-A004079; TR-0075(5901-01)-3; SAMSO-TR-75-18) Avail: NTIS CSCL 20/4

The report describes a parametric study of the shock-wave-induced-unsteady flow over various simple two-dimensional shapes. The Godunov finite difference technique is used to model the flow. Good agreement is found between numerical predictions and available data for early times. The effect of body geometry, height of body above ground, and shock strength on the lift, drag, and pressure distribution on the body are computed. GRA

N75-25881# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
AERODYNAMIC ANALYSIS OF A GENERAL PURPOSE TOW TARGET
J. B. Smith 3 Dec. 1974 21 p refs
(AD-A003497; NADC-74132-30) Avail: NTIS CSCL 01/3

This report presents the aerodynamic characteristics of a proposed aerial tow target configured to meet the general purpose tow target requirements of the Navy Standard Tow Target System. The General Purpose Tow Target will serve as a target for missile and gunnery weapon firing exercises and will be capable of air launch and recovery. GRA

N75-25882# Marquardt Corp., Van Nuys, Calif.
A/A 47U-3 TOW TARGET REELING MACHINE LAUNCHER SYSTEM
Dec. 1974 16 p Revised
(AD-A004622) Avail: NTIS CSCL 01/3

The A/A 47 U-3 target launcher designed to provide target towing capability for subsonic and supersonic military aircraft is described. Performance, design features, operation, installation, and ground support equipment are included. J.M.S.

N75-25883# Lockheed-Georgia Co., Marietta.
A METHOD FOR PREDICTING ACOUSTICALLY INDUCED VIBRATION IN TRANSPORT AIRCRAFT, APPENDIX Final Report
Harold W. Bartel and Cecil W. Schneider Sep. 1974 54 p refs
(Contract F33615-73-C-3638; AF Proj. 1370)
(AD-A004215; LG74ER0121-App-1; AFFDL-TR-74-App-1) Avail: NTIS CSCL 01/3

A method is set forth for predicting the acoustically induced structural vibration in transport category aircraft. Charts are presented which correlate third-octave random noise and vibration levels at various confidence levels, for the frequency range of 50 to 2500 Hertz. The prediction charts are based on measured data from modern transport aircraft and are presented for the normal direction, ground operation, and a reference structural mass and rigidity. Shell-type structure (fuselage, pods, fairings) and box-type structure (wing, horizontal/vertical stabilizer) are treated separately. Means are provided for predicting lateral and tangential vibration, vibration in pressurized cruise flight, and for correcting for changes in structural mass and rigidity. Application of the method to a hypothetical airplane design case is illustrated in an example. GRA

N75-25884# Lockheed-Georgia Co., Marietta.
REYNOLDS NUMBER EFFECTS ON THE BOATTAIL CHARACTERISTICS OF A SIMULATED NACELLE AT A MACH NUMBER OF 0.8 Final Report, 1 Dec. 1973 - 8 Aug. 1974

Ted Dansby Oct. 1974 78 p refs
(Contract F33615-74-C-4021; AF Proj. 7064)
(AD-A004803; LG74ER0078; ARL-74-0120) Avail: NTIS CSCL 01/3

The effect of Reynolds number on the boattail drag of three simulated afterbody configurations is presented for zero angle of attack for a Mach number of 0.8. The boattail pressure drag for one of the configurations is shown to first decrease, then significantly increase, as the Reynolds number increases. The behavior is explained by the regular variation of pressures in regions of the boattail. The mechanism governing this behavior is discussed and is partially predicted from state-of-the-art theoretical techniques. The influence of model installations and test techniques is shown to have a marked effect on the level of the drag. GRA

N75-25885# Advanced Technology Center, Inc., Dallas, Tex.
EXPERIMENTAL MATING OF TRAPPED VORTEX DIFFUSERS WITH LARGE AREA RATIO THRUST AUGMENTORS Final Report, Jun. 1973 - Jan. 1974
Charles H. Haight and Robert M. ODonnell Sep. 1974 52 p refs
(Contract F33615-73-C-4151; AF Proj. 7116)
(AD-A004802; B-94300/4CR-8; ARL-74-0115) Avail: NTIS CSCL 01/3

The performance of a straight wall diffuser and various trapped vortex diffusers was measured with a basic ARL ejector as a test bed. The straight wall diffuser, termed Configuration F by Aerospace Research Laboratories (ARL), yielded thrust augmentation ratios in near agreement with those previously obtained by ARL. Also, as noted by ARL, the thrust augmentation of Configuration F was insensitive to changes in the primary injector pressure. The trapped vortex diffusers investigated were of varying lengths. GRA

N75-25886# Flow Research, Inc., Kent, Wash.
AN ANALYTICAL STUDY OF THE EFFECTS OF SURFACE ROUGHNESS ON BOUNDARY-LAYER TRANSITION
C. L. Merkle, T. Kubota, and D. R. S. Ko Oct. 1974 40 p refs
(Contract F44620-74-C-0049)
(AD-A004786; Flow-Res-40; AFOSR-75-0190TR) Avail: NTIS CSCL 20/4

An analytical model has been developed to describe the manner in which distributed surface roughness affects transition. The model pictures the roughness as having two distinct effects: one, it introduces higher disturbance levels in the boundary layer; and two, it alters the mean velocity profile and, hence, the growth rate of the disturbances. The alteration of the mean velocity profile is described by means of a turbulent sublayer, which visualizes an enhanced momentum transfer in a narrow layer next to the surface. The corresponding change in the amplification of disturbances is then determined by means of linear stability theory, and is related to transition by an empirical transition criterion. GRA

N75-25887# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY OF THE FLOW AROUND PLANE AND AXIALLY SYMMETRICAL BODIES WITH A SEPARATED SHOCK WAVE BY A FLOW AT LOW SUPERSONIC SPEED
S. M. Gilinskii and M. G. Lebedev 6 Dec. 1974 20 p refs Transl. into ENGLISH from Akad. Nauk SSSR. Izv. Mekhan. (USSR), no. 1, Jan. - Feb. 1965 p 17-23
(AD-A004442; FTD-MT-24-2287-74) Avail: NTIS CSCL 20/4

This work is a continuation of the study of the flow around bodies of various forms by a supersonic flow of an ideal gas. G. F. Telenin's method for the integration of equations of gas dynamics is used in the calculation of the flow around plane and axially symmetrical bodies by a flow at low supersonic speed. Basically the range of Mach numbers M -2 is examined. A comparison is carried out with experimental data and the results of calculations with the use of other numerical methods. GRA

N75-25888# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
INVESTIGATION OF THE TURBULENT PROPERTIES OF THE WAKE BEHIND SELF-PROPELLED, AXISYMMETRIC BODIES Final Report
C. C. Chieng, A. K. Jakubowski, and J. A. Schetz Sep. 1974 124 p refs
(Contract N00014-72-A-0136-0004; ARPA Order 1910; NR Proj. 062-481)
(AD-A004296; VPI-AERO-025) Avail: NTIS CSCL 20/4

The turbulent wakes behind a streamlined drag body, a jet propelled body and a propeller-driven body are studied experimentally in the VPI Stability Wind Tunnel at a nominal free stream velocity of 206 ft/sec. The turbulence properties investigated are axial, radial, and tangential turbulence intensities, and radial and tangential shear stresses. GRA

N75-25889# Polytechnic Inst. of New York, Farmingdale.
RAREFIED FLOW FIELD ABOUT A HEMISPHERE CYLINDER
R. J. Cresci and R. Torrani 1974 15 p refs Reprint Presented at the 9th Intern. Symp. on Rarefied Gas Dynamics, Gottingen, West Ger., 15-20 Jul. 1974
(Contract F44620-71-C-0008; AF Proj. 9781)
(AD-A004538; AFOSR-75-0116TR) Avail: NTIS CSCL 20/4

This study involves the measurement of detailed flow profiles including mass flow, temperature, and pitot pressure between the body and the free stream over a hemisphere cylinder. Although such quantities as surface heat transfer, and shock standoff distance, have been previously obtained, the detailed flow characteristics have not been generally available. The present measurements have been made at various stations around the nose and on the cylindrical portion of the model. GRA

N75-25890# Naval Ordnance Lab., White Oak, Md.
WIND-TUNNEL STUDY OF OSCILLATING FLOW-INDUCED SURFACE PRESSURES ON A TENSION-CONE GEOMETRY MODEL
Frank P. Baltakis 21 Jan. 1974 45 p refs
(NOL Proj. 800-AF)
(AD-A004608; NOLTR-74-134) Avail: NTIS CSCL 20/4

Oscillating flow about a spiked body in a supersonic stream has been investigated in a wind tunnel at Mach 5 at free-stream unit Reynolds numbers of 2,500,000 to 20,000,000 per foot using fast-response pressure transducers, accelerometers and schlieren movie cameras. A tension-cone-type model with replaceable nosetips of two different lengths and two different surface roughnesses was used. GRA

N75-25891# Texas A&M Univ., College Station.
THEORETICAL PREDICTION OF AIRLOADS ON THIN DELTA WINGS IN INCOMPRESSIBLE FLOW
B. M. Rao and W. P. Jones Jan. 1975 46 p refs
(Contract N00014-68-A-0308-0007)
(AD-A004654; TEES-3029-75-01) Avail: NTIS CSCL 01/1

Two methods are developed for the prediction of aerodynamic loads on sharp-edged delta wings in incompressible flow. The first method is based on the application of the Polhamus suction analogy to the potential flow solution which is obtained in this paper by a unique numerical lifting surface method developed at Texas A and M University. The second method is a direct extension of potential flow theory. The mathematical model is modified by introducing a vortex system to represent the leading edge separation. The strength of the separated vortices are adjusted by an empirical factor whose value is chosen in such a way that the total system gives the required lift. GRA

N75-25892# Naval Air Development Center, Warminster, Pa. Dept. of Air Vehicle Technology.
AIR LAUNCH CHARACTERISTICS OF THE MQM-74C TARGET DRONE FROM DC-130A AIRPLANE
Mark Lempert 9 Jan. 1975 125 p refs
(AD-A004190; NADC-74079-30) Avail: NTIS CSCL 01/3

A six-degree-of-freedom simulation study was conducted to predict air launch separation characteristics of the MQM-74C aerial target drone from a DC-130A. The effects of various launch aircraft flight conditions, flow field effects, autopilot control system malfunction, and loss of engine power on target separation characteristics were analyzed. GRA

N75-25893# Nielsen Engineering and Research, Inc., Mountain View, Calif.
ANALYTICAL INVESTIGATION OF HINGE MOMENTS ON MISSILE TRAILING-EDGE CONTROL SURFACES Final Technical Report, 25 Feb. - 30 Jun. 1974
Selden B. Spangler, Frederick K. Goodwin, and Jack N. Nielsen Sep. 1974 29 p
(Contract DAAH01-74-C-0578)
(AD-A004028; NEAR-TR-76) Avail: NTIS CSCL 16/4

An inviscid analysis of a fin-alone with a trailing-edge elevon was made assuming various perturbations of the configuration in order to gain some insight into high elevon hinge moments experienced in flight on a missile. The perturbations examined were camber, twist and dihedral, all of which could be induced by thermal distortion. A possible fix was also investigated by considering a gap to occur between the fin trailing edge and the elevon leading edge. Deductions on the cause of the high hinge moments were made based on the calculations. The Mach number range considered was 1.6 to 3.0. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N75-25894# Texas A&M Univ., College Station. Flight Mechanics Lab.
AERODYNAMIC SPOILER FOR PREVENTING AIRPLANE STALL/SPIN TYPE ACCIDENTS Final Report
H. I. Chevalier Dec. 1974 77 p refs
(Contract DOT-FA73WA-3192)
(AD-A006995; FAA-RD-75-21) Avail: NTIS HC $4.75 CSCL 01/3

A flight test investigation was conducted to evaluate the feasibility of an aerodynamic spoiler system installed on a Piper PA-30 airplane for deterring stall, and to determine its effectiveness as a stall deterrent for other light twin-engine general aviation airplanes. Flight tests were conducted for the airplane without the spoiler installed, with the spoiler operated manually, and with the spoiler operated automatically. Test results were obtained for different c.g. locations, flap positions, and engine thrust. Flight test maneuvers included approaches to stall from straight level flight, climbs, descents, turns, slips, and skids with both engines operating and with simulated single engine operation. Tests also included takeoffs and landings. Test results show that the spoiler concept is feasible for an airplane with a horizontal tail where the complete surface is moveable. Author

N75-25895# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Aerodynamik.
ASPECTS OF GERMAN RESEARCH IN CIVIL AERONAUTICS
Fred Thomas 1975 27 p refs In GERMAN; ENGLISH summary
Presented at the Ann. DFVLR Meeting, Munich, 7 Nov. 1974
(DLR-Mitt-75-03) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. DM 12.20

Future research in aeronautics is determined by the limited energy resources, environmental aspects, and increasing traffic congestion. Instead of continuing to increase the velocity potential, research topics are now aimed at decreasing operational costs, increasing reliability, and increasing compatibility with the environment. Economical and ecological considerations dictate further development far more than technical possibilities.
Author (ESRO)

N75-25896# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
WET RUNWAY AIRCRAFT CONTROL PROJECT F-4 RAIN TIRE PROJECT Final Report, Mar. 1971 - Oct. 1974
William V. Tracy, Jr. Oct. 1974 383 p refs
(AF Proj. 5549)
(AD-A004768; ASD-TR-74-37) Avail: NTIS CSCL 01/3

This report presents the results of all efforts to study the problem of wet runway control of the F-4 fighter aircraft. The hardware tested is as follows: Hytrol Mark II Brake Control System, Hytrol Mark III Brake Control System, Standard Main Tire, Dunlop Main Tire, Sommer Main Tire, BFG Main Tire, USAF Main Tire, Dual Mode Hydro-Electrical Control Steering System, Standard Nose Tire, Dunlop Nose Tire, BFG Nose Tire, and USAF Nose Tire. In addition to this, testing was also completed to determine the variation in main tire spinup time with touchdown sink rate and the effect resulting from 50% worn main tires. GRA

N75-25897# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ORIENTATION-ERROR ACCIDENTS IN REGULAR ARMY AIRCRAFT DURING FISCAL YEAR 1971: RELATIVE INCIDENCE AND COST
W. Carroll Hixson and Emil Spezia 18 Nov. 1974 46 p refs (MF51524005)
(AD-A004189; NAMRL-1209; USAARL-75-6) Avail: NTIS CSCL 01/2

The report is the fifth in a series of reports dealing with the pilot disorientation/vertigo accident problem in Army fixed wing and rotary wing flight operations. Incidence and cost data presented for fiscal year 1971 include a total of 50 major and minor orientation-error accidents (25 of which were fatal), resulting in 65 fatalities, 67 nonfatal injuries, and an over-all aircraft damage cost of $11,404,119. The contribution of rotary wing accidents to this total was 47 accidents (23 of which were fatal), resulting in 62 fatalities, 67 nonfatal injuries, and an over-all aircraft damage cost of $11,191,377. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-25898# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DABS CHANNEL MANAGEMENT
E. J. Kelly 8 Jan. 1975 246 p refs
(Contracts DOT-FA72WAI-261; F19628-73-C-0002)
(AD-A006759; ATC-43; FAA-RD-74-197) Avail: NTIS HC $7.50 CSCL 17/7

The report consists of three major parts: Part I, Channel Control; Part II, Roll-Call Scheduling; and Part III, Transaction Preparation, Target List Update, and Transaction Update. Together they encompass the five basic subfunctions of channel management. The design of the DABS channel management function is discussed. Channel management regulates all activity on the RF channel, scheduling ATCRBS interrogations and DABS roll-call interrogations and replies. Channel management arranges for multiple interrogations when required to satisfy both the surveillance and the communications functions of the sensor, and for reinterrogations in the event of link failure. Author

N75-25899# National Aviation Facilities Experimental Center, Atlantic City, N.J.
COLOR DISPLAY EVALUATION FOR AIR TRAFFIC CONTROL Final Report, Jan. - Aug. 1974
Donald W. Connolly, Gerard Spanier, and Florence Champion May 1975 50 p refs
(AD-A010779; FAA-NA-74-54; FAA-RD-75-39) Avail: NTIS HC $3.75 CSCL 17/7

Experiments and survey-analysis were performed to assess the operational utility potential and the technical feasibility of penetration phosphor cathode-ray tube displays in air traffic control applications. The experiments, designed to test the usefulness of color as an aid to air traffic information presentation, involved collection of data on several hundred responses from subject-observers. Each of four colors could be identified with 97- to

99-percent accuracy. The use of color where display symbology overlaps was found to increase accuracy of interpretation by a factor of three or more over monochromatic display. The use of color to augment or reinforce altitude information or future route-of-flight information did not appear to improve controller performance in the prediction of separation rule violations.
Author

N75-25900# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DEVELOPMENT OF A DISCRETE ADDRESS BEACON SYSTEM Quarterly Technical Summary, 1 Oct. - 31 Dec. 1974
1 Jan. 1975 72 p refs
(Contracts DOT-FA72WAI-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(AD-A007060; FAA-RD-75-4) Avail: NTIS HC $4.25 CSCL 17/7

Work performed to develop a discrete address beacon system is presented, covering the period 1 October through 31 December, 1974. The results of analytical studies, laboratory and flight experiments, and software developments supporting the concept feasibility and performance definition phase of the FAA DABS program, are presented. Discussions of sensor reply processing, antenna design, avionics cost reduction, link performance, and facility operation are included. Author

N75-25901*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
FLIGHT TEST AND EVALUATION OF OMEGA NAVIGATION FOR GENERAL AVIATION
Peter V. Hwoschinsky Jun. 1975 266 p refs
(Grant NGL-22-009-640)
(NASA-CR-132677) Avail: NTIS HC $8.50 CSCL 17G

A seventy hour flight test program was performed to determine the suitability and accuracy of a low cost Omega navigation receiver in a general aviation aircraft. An analysis was made of signal availability in two widely separated geographic areas. Comparison is made of the results of these flights with other navigation systems. Conclusions drawn from the test experience indicate that developmental system improvement is necessary before a competent fail safe or fail soft area navigation system is offered to general aviation. Author

N75-25902# TRW Systems Group, Redondo Beach, Calif.
AUTONOMOUS NAVIGATION TECHNOLOGY, PHASE 1 Final Report, 15 Mar. 1973 - 30 Aug. 1974
I. J. Williams Aug. 1974 283 p
(Contract F04701-73-C-0222)
(AD-A003824; TRW-23850-6023-TU-00; SAMSO-TR-74-244) Avail: NTIS CSCL 17/7

The design and development of a critical component for autonomous orbit navigation is summarized. The previously developed autonomous navigation system design relies on a combined star and unknown landmark tracker (SLANT) for the precision updates required. The design and development of the SLANT was accomplished with parallel development efforts on the optical, mechanical and electronic components of the tracker. Each component development effort included a test program to verify achievement of the performance required. The components were successfully developed and integrated into an engineering model of SLANT. Software was developed for a CDC 1700 laboratory computer to provide operational support for SLANT and to run a SLANT system test. The software and laboratory test setup was used to demonstrate SLANT functional performance. GRA

N75-25903# Naval Postgraduate School, Monterey, Calif.
IMPROVEMENT OF AN/TPQ-27 FILTER AND CONTROL TECHNIQUES M.S. Thesis
Robert Eugene Lantz Dec. 1974 201 p refs
(AD-A003878) Avail: NTIS CSCL 17/7

A modified linear Kalman filter with deterministic forcing is used to improve the tracking capabilities of the Marine Corps AN/TPQ-27 remote tactical aircraft guidance system. Both sixth and ninth order filters are developed and used with the Precision and Coarse Guidance simulation programs. A technique for overcoming the effects of autopilot bias is presented and tested through simulation. Precision Guidance control is modified to utilize angle error and angle error rate to generate corrective commands. Significant improvement in aircraft state estimation, bombing accuracy, and overall system response is shown. The Coarse guidance algorithms and simulation program perform aircraft guidance to the bombing run with more than adequate precision under simulated conditions. GRA

N75-25904# Control Data Corp., Minneapolis, Minn.
PROTOTYPE DEVELOPMENT AND TESTING AUTOMATED ASTRONOMIC POSITIONING SYSTEM Final Report, 20 Mar. 1972 - 31 Mar. 1974
Joseph E. Carroll 25 Oct. 1974 57 p refs
(Contract F19628-72-C-0265; AF Proj. 4304)
(AD-A004152; AFCRL-TR-74-0254) Avail: NTIS CSCL 17/7

The Automated Astronomic Positioning System (AAPS) is a portable astro-geodetic field instrument developed to provide astronomic latitude and longitude. It is impersonal, automatic, and performs most of the computations at the site using a miniature 469 computer. These features substantially reduce the training and office computations currently required for conventional methods. This report covers the fabrication and testing of two prototype systems. Field tests have thoroughly demonstrated the ease of operation and environmental survival originally hoped for in the design. Major site equipment items weigh a total of 65 kg (144 lbs.) and come in three pieces: a Sensor Head, containing optics, leveling system, and photodetectors; a Control Unit, containing computer, clock, and control-display panel; and a battery pack capable of a minimum of 10 hours system operation. Position accuracy has been demonstrated to the plus or minus 0.35 arc second (one sigma) level after averaging six reversal pairs of data and correcting for instrument biases. GRA

N75-25905# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
A UNIVERSAL FLIGHT DIRECTOR COMPUTER Final Report
Gerald W. Francis Aug. 1974 59 p
(AD-A003634; ASD-TR-74-20) Avail: NTIS CSCL 17/7

A technique is proposed which will make the flight director computer performance independent of aircraft dynamics, wind or aircraft position relative to the navigation beam. The control law proposed will compensate for all such variables with an error correcting mechanism. This technique results in a computer that is universal in its application. GRA

N75-25906# Martin Marietta Aerospace, Denver, Colo.
SPACE SEXTANT HIGH-ALTITUDE NAVIGATION SYSTEM (SS-HANS) STUDY PHASE 0. VOLUME 1. SUMMARY Final Report, 17 Jun. 1974 - 1 Feb. 1975
A. Dale Mikelson, W. J. Owen, and H. A. Garcia Mar. 1975 55 p
(Contract F04701-74-C-0566; AF Proj. 681D)
(AD-A008100; MCR-75-5-Vol-1; SAMSO-TR-75-73-Vol-1) Avail: NTIS CSCL 17/7

The Space Sextant-High Altitude Navigation System (SS-HANS) study was to prepare a preliminary design of this system and to demonstrate its performance thru detailed Monte-Carlo digital simulation. Not only did the design meet all its requirements, but of as much or more significance, the Space Sextant design has inherent accuracies that will permit design of an attitude reference and pointing system that will have more accuracy than any in existence or under development. The SS-HANS was designed to satisfy the highest levels of autonomy by onboard determination of spacecraft position in inertial space. The system was also to be designed to operate for a period of 5 years in a severe nuclear environment and on spacecraft that have attitude limit cycles and that maneuver. User applications of this design could range from deep space near-planet navigation to autonomous operation of strategic and tactical space systems. The space sextant would allow attitude control to within 0.1 arc sec (0.5 micron rad). GRA

N75-25907# Martin Marietta Aerospace, Denver, Colo.
SPACE SEXTANT HIGH-ALTITUDE NAVIGATION SYSTEM (SS-HANS) STUDY. VOLUME 2. CONFIGURATION TRADE STUDY Report for 17 Jun. 1974 - 1 Feb. 1975
W. J. Owen Mar. 1975 132 p refs

(Contract F04701-74-C-0566)
(AD-A008101/8; MCR-75-5-Vol-2) Avail: NTIS CSCL 17/7

Conceptual designs were performed of three sextant configurations. Their performance potential, development risk, and satellite versatility were evaluated. Results are presented as well as the results of preliminary screening efforts of candidate time reference and potential mass storage systems. GRA

N75-25908# Martin Marietta Aerospace, Denver, Colo.
SPACE SEXTANT HIGH-ALTITUDE NAVIGATION SYSTEM (SS-HANS) STUDY. VOLUME 4. PRELIMINARY DESIGN DESCRIPTION Report for 17 Jun. 1974 - 1 Feb. 1975
W. J. Owen, R. Booker, and S. Morikawa Mar. 1975 155 p refs
(Contract F04701-74-C-0566; AF Proj. 681D)
(AD-A008103; MCR-75-5-Vol-4; SAMSO-TR-75-73-Vol-4) Avail: NTIS CSCL 17/7

A description of the preliminary design of the Space Sextant-High Altitude Navigation System (SS-HANS) is contained in this volume of the Phase 0 final report. Engineering effort was directed primarily at the detailed preliminary design of the Space Sextant and in the definition of the software, computation and storage requirements for navigation with the sextant. This detailed preliminary design effort was conducted upon completion of configuration trade studies as documented in Volume 2 and of the Prime Item Development Specification documented in Volume 3. GRA

N75-25909# Martin Marietta Aerospace, Denver, Colo.
SPACE SEXTANT HIGH-ALTITUDE NAVIGATION SYSTEM (SS-HANS) STUDY. VOLUME 5. SENSITIVITY ANALYSIS Final Report, 17 Jun. 1974 - 1 Feb. 1975
H. A. Garcia and J. W. Schlemmer Mar. 1975 85 p refs
(Contract F04701-74-C-0566; AF Proj. 681D)
(AD-A008104; MCR-75-5-Vol-5; SAMSO-TR-75-73-Vol-5) Avail: NTIS CSCL 17/7

This sensitivity analysis is intended to demonstrate, quantitatively, the effects of various error sources upon SS-HANS navigation accuracy. The error sources considered in this study fall into four basic categories, viz. those that pertain to the sensor itself; those that pertain to the initial conditions for each of the selected orbits; those that pertain to the position of the moon; and those that pertain to the dimensions of the moon. Navigation sensitivities to various levels of error (multiples and submultiples of the nominal error) for each of the four basic categories have been analyzed with respect to five high altitude orbits, considered to be typical of future Air Force missions. GRA

N75-25910# Martin Marietta Aerospace, Denver, Colo.
SPACE SEXTANT HIGH-ALTITUDE NAVIGATION SYSTEM (SS-HANS) STUDY. VOLUME 6. PERFORMANCE DEMONSTRATION Final Report, 17 Jun. 1974 - 1 Feb. 1975
H. A. Garcia and J. W. Schlemmer Mar. 1975 61 p
(Contract F04701-74-C-0566; AF Proj. 681D)
(AD-A008105; MCR-75-5-Vol-6; SAMSO-TR-75-73-Vol-6) Avail: NTIS CSCL 17/7

The results are presented of a Monte Carlo analysis of two selected orbits which are the principal test cases for the evaluation of the SS-HANS concept. Curves are shown, which depict the navigation accuracies for population coverages at the 97% confidence level. Results of a linear covariance analysis are included. F.O.S.

N75-25911# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INERTIAL NAVIGATION THEORY (AUTONOMOUS SYSTEMS)
V. D. Andreev 17 Dec. 1974 615 p refs Transl. into ENGLISH from Teor. Inertsialnoi Navigatsii (USSR), 1966 p 1-579
(AD-A004663; FTD-HC-23-893-74) Avail: NTIS CSCL 17/7

The main attention is devoted to the equations of ideal operations (unperturbed functioning) of inertial systems, which determine their structure, and to equations of inertial navigation system errors, an analysis of which permits evaluation of the operating stability of the system and establishment of the relationship between the errors of the elements and the accuracy of determining the navigational parameters of the object: the current coordinates of position and its orientation in space. Problems of autonomous preparation of inertial systems for operation are also considered. The book is devoted to the theory of autonomous inertial systems. GRA

N75-25912# Mitre Corp., Bedford, Mass.
FLIGHT TEST OF AN INTEGRATED TDMA DATA LINK/LORAN-C NAVIGATION AND SYNCHRONIZATION SYSTEM
E. A. Westbrook Jan. 1975 30 p
(Contract F19628-73-C-0001)
(AD-A004476; MTR-2850; ESD-TR-74-309) Avail: NTIS CSCL 17/7

An integrated computer program for TDMA data link synchronization and position determination from Loran-C and data link signal times-of-arrival was written for an IBM 4pi computer and flight tested. The primary intent was to verify on a small scale in the real world a simulation being used in development of the technique. Results highlighted the importance of measurement geometry and synchronization problems when using overland Loran-C. GRA

N75-25913# Mitre Corp., Bedford, Mass.
RECURSIVE NAVIGATION ALGORITHM FOR ELECTRONIC GRID INTEGRATION
R. C. Snodgrass Jan. 1975 95 p refs
(Contract F19628-73-C-0001)
(AD-A004477; MTR-2821; ESD-TR-74-308) Avail: NTIS CSCL 17/7

This paper defines the software design of the position location and synchronization algorithm in use during the final flight tests of the Electronic Grid Integration Program. GRA

N75-26174 Joint Publications Research Service, Arlington, Va.
KINEMATIC EQUATIONS OF ERRORS OF CELESTIAL NAVIGATION SYSTEMS
V. A. Karakashev and V. A. Udalov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 1-6 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 67-71 (For availability see N75-26173 17-31)

N75-26780 Marconi-Elliott Avionic Systems Ltd., Rochester (England).
THE APPLICATION OF DISPLAYS IN NAVIGATION/ATTACK SYSTEMS
J. T. Shepherd *In* AGARD Electro-Opt. Systems May 1975 19 p (For availability see N75-26778 17-70)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-25914* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH LIFT AIRCRAFT Patent
Willard S. Blanchard, Jr. and Joseph L. Johnson, Jr., inventors (to NASA) Issued 20 May 1975 6 p Filed 5 Jun. 1973 Supersedes N73-26007 (11-17, p 1980)
(NASA-Case-LAR-11252-1; US-Patent-3,884,432; US-Patent-Appl-SN-367268; US-Patent-Class-244-15; US-Patent-Class-D12-76; US-Patent-Class-244-13; US-Patent-Class-244-42DA; US-Patent-Class-244-55) Avail: US Patent Office CSCL 01C

An aerodynamically balanced high-lift aircraft is proposed in which the problems of large nose-down pitching moments generated by the flap high-lift forces, the loss of trim lift during high-lift flight and the yawing moments caused by the loss of an engine are solved without the use of large horizontal and vertical tails. A wing is carried by and bounced on the tips by spaced-parallel fuselages; horizontal tails are mounted only onto

the outboard surfaces of the wing-tip fuselages, the centroid-of-lift of the high-lift flaps is located substantially at the center of gravity of the aircraft and the exhausts of the engines are emitted in the vertical plane of symmetry of the aircraft. Yawing moments ockurring during flight with an engine inoperative are reduced; the horizontal tails carry an upload and contribute positive trim lift; large nose-down pitching moments generated by the high-lift flaps are minimized and noise levels are reduced.
Official Gazette of the U.S. Patent Office

N75-25915* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SHOULDER HARNESS AND LAP BELT RESTRAINT SYSTEM Patent
Albert P. Garavaglia and Dennis S. Matsuhiro, inventors (to NASA) Issued 3 Jun. 1975 4 p Filed 19 Mar. 1974 Supersedes N74-18805 (12 - 10, p 1137)
(NASA-Case-ARC-10519-2; US-Patent-3,887,233; US-Patent-Appl-SN-452767; US-Patent-Class-297-389; US-Patent-Class-280-150SB; US-Patent-Class-297-385; US-Patent-Class-297-388) Avail: US Patent Office CSCL 06Q
A shoulder harness and lap belt restraint system are provided where the lap belt is combined with the shoulder harness so that a single fastening secures both the shoulder strap and the lap belt.
Official Gazette of the U.S. Patent Office

N75-25916*# Douglas Aircraft Co., Inc., Long Beach, Calif.
ENGINE/AIRFRAME COMPATIBILITY STUDIES FOR SUPERSONIC CRUISE AIRCRAFT
May 1975 59 p
(Contract NAS1-13229)
(NASA-CR-132610-1; MDC-J4505-Suppl) Avail: NTIS HC $4.25 CSCL 01C
Engine/airframe compatibilities are studied utilizing the advanced supersonic transport point design as the baseline for comparison. Detailed studies of four engines are given. The technical analysis, configuration descriptions, and study results are presented for each of the four specific engines studied.
M.C.F.

N75-25917*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A STOL AIRWORTHINESS INVESTIGATION USING A SIMULATION OF AN AUGMENTOR WING TRANSPORT. VOLUME 2: SIMULATION DATA AND ANALYSIS Final Report
Robert K. Heffley, Robert L. Stapleford, Robert C. Rumold, John M. Lehman, Barry C. Scott, and Charles S. Hynes Oct. 1974 222 p refs Prepared in cooperation with Systems Technology, Inc., Mountain View, Calif. and FAA, Moffett Field, Calif.
(Contract NAS2-7926)
(NASA-TM-X-62396; AD-A006602; FAA-RD-74-179-Vol-2; A-5798) Avail: NTIS CSCL 01/3
A simulator study of STOL airworthiness was conducted using a model of an augmentor wing transport. The approach, flare and landing, go-around, and takeoff phases of flight were investigated. The simulation and the data obtained are described. These data include performance measures, pilot commentary, and pilot ratings. A pilot/vehicle analysis of glide slope tracking and of the flare maneuver is included.
Author

N75-25918*# Scientific Translation Service, Santa Barbara, Calif.
DESIGN OF AIRCRAFT WHEELS AND BRAKE SYSTEMS
I. I. Zverev and S. S. Kokonin Washington NASA Jun. 1975 260 p refs Transl. into ENGLISH of the book "Proyektirovaniye Aviatsionnykh Koles i Tormoznykh Sistem" Moscow, Mashinostroyeniye Press, 1973 224 p
(Contract NASw-2483)
(NASA-TT-F-15764) Avail: NTIS HC $8.50 CSCL 01C
The experience in the design and analysis of aircraft wheels and brakes, brake systems, brake control systems, and antiskid systems is summarized. The static and fatigue strength of aircraft wheels, calculation of brake service life, brake dynamics, techniques for increasing brake energy absorption capacity, and design of the basic antiskid system elements are examined.
Author

N75-25919# Fairchild Republic Div., Farmingdale, N.Y.
PRELIMINARY DESIGN OF WINGS. VOLUME 4. MINIMUM WEIGHT DESIGN OF COMPOSITE STRUCTURE Final Technical Report, Feb. 1971 - Oct. 1972
Harold Switzky Mar. 1974 58 p refs
(Contract F33615-71-C-1241; AF Proj. 1368)
(AD-A003667; AFFDL-TR-74-20-Vol-4) Avail: NTIS CSCL 01/3
Minimum weight design procedures are developed for composite structure fabricated with plies oriented 0, plus or minus 45, and 90 degrees to the longitudinal axis and subjected to an arbitrary biaxial loading. The design technique for stable structure is based upon a generalized ellipsoidal failure model which includes as special cases the classical models for orthotropic and isotropic structural behavior. The strength and interaction parameters are established by a statistical fit of the available experimental data.
GRA

N75-25920# Rock Island Arsenal Lab., Ill. General Thomas J. Rodman Lab.
ESTIMATION OF LOCATING ERRORS AND RESOLUTION OF AN RPV/CLGP SYSTEM
Leonard B. Gardner and Dick A. Bergren Dec. 1974 48 p refs
(Contract DAAA09-74-C-2051)
(AD-A003957; RIA-R-TR-74-040) Avail: NTIS CSCL 01/3
Mini-RPV is considered as part of the CLGP Weapon system for the purpose of locating and designating targets for tube artillery systems. The errors of several different types of instrumentation payloads and airframes are estimated and compared to the locating errors for forward observers.
GRA

N75-25921# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF A FUSELAGE ON WING CHARACTERISTICS Final Report, 1 Apr. 1964 - 31 Mar. 1968
Fumio Yoshino Oct. 1975 215 p refs
(Contract Nonr-1858(46); NR Proj. 212-155)
(AD-A003955; AMS-TR-1151) Avail: NTIS CSCL 01/1
A series of experimental investigations utilizing flow visualization, force measurement and pressure distribution techniques to investigate the effect on wing lift of fuselage placement and cross-sectional shape are reported. Emphasis is placed on conditions involving large circulation including the use of circulation control.
GRA

N75-25922# Naval Postgraduate School, Monterey, Calif.
AIRCRAFT FUEL TANK VULNERABILITY TO HYDRAULIC RAM: MODIFICATION OF THE NORTHROP FINITE ELEMENT COMPUTER CODE BR-1 TO INCLUDE FLUID-STRUCTURE INTERACTION: THEORY AND USERS MANUAL FOR BR-1 HR Final Report, 1 Jul. 1973 - 30 Jun. 1974
R. E. Ball Jul. 1974 35 p refs
(AD-A003471; NPS-57BP74071) Avail: NTIS CSCL 01/3
The finite element digital computer code BR-1, developed by the Northrop Corporation, for predicting the effects of internal air blast on combat aircraft structures is modified to include the effects of compressible fluid-structure interaction. The true interaction phenomenon is approximated by the piston theory. The modification enables the code to be used to predict the structural response of aircraft fuel tanks subjected to penetrating bullets and fragments.
GRA

N75-25923# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
GUARDRAIL IIA RU-21H EVALUATION Final Report
George M. Yamakawa, Tom P. Benson, and Larry K. Brewer Jul. 1974 34 p refs
(AD-A004009; USAAEFA-74-35) Avail: NTIS CSCL 01/3
The United States Army Aviation Engineering Flight Activity conducted a flying qualities evaluation of the GUARDRAIL IIA RU-21H aircraft, manufactured by Beech Aircraft Corporation. The RU-21H aircraft was tested at the Beech facility in Wichita, Kansas, on 11 and 12 May 1974. During the test program, 4.0 productive hours were flown. The program included a stability and control evaluation and miscellaneous engineering tests

necessary to provide substantiating data to aid the GUARDRAIL IIA airworthiness determination. Within the scope of this test, the flying qualities of the GUARDRAIL IIA RU-21H aircraft are satisfactory. GRA

N75-25924# Naval Postgraduate School, Monterey, Calif.
A COMPUTERIZED DATA REDUCTION PROGRAM FOR THE CESSNA 310H AIRCRAFT M.S. Thesis
Alan Walker Yates Sep. 1974 50 p refs
(AD-A003532) Avail: NTIS CSCL 01/1

The objective of this thesis was to develop a computer program for use in evaluating data acquired from the Department of Aeronautics Cessna 310H model aircraft. The program was designed for use with the IBM 360 computer, in conjunction with a CALCOMP plotter. Using information taken from the engine curves for the aircraft, the program evaluates input data, determines the power required for flight at altitude, reduces the values to equivalent sea level values and outputs a graph of power versus velocity for level flight. Lift and drag coefficients are calculated as functions of aircraft weight, velocity, and power required, and are plotted on a second graph. GRA

N75-25925# General Dynamics Corp., San Diego, Calif. Convair Aerospace Div.
APPLICATION OF HIGH TEMPERATURE COMPOSITES TO AN AIRCRAFT COMPONENT Final Report, Jun. 1973 - Mar. 1974
W. F. Wennhld May 1974 124 p refs
(Contract N62269-74-C-0757)
(AD-A003546; CASD-NSC-74-001) Avail: NTIS CSCL 11/4

The initial phase covered by this report was to include the design and analysis of two canard structures, one constructed primarily of boron/aluminum, the other primarily of graphite/polyimide. Both designs were then to be compared for weight saving, cost, and technical risk. A decision was then to be made to build two canard structures for structural testing. Depending upon the outcome of the evaluation, one of each material or two of one material would be built and tested. A NASTRAN model was prepared and used in the sizing of structural elements. Up to eight iterations were required in order to achieve a design which met the requirements. The Gr/PI canard design was not successfully completed. Because of the results with the Gr/PI canard, the effort was diverted to the B/Al configuration. Two subelement specimen tests were performed in order to evaluate the use of boron/aluminum crossplied material in a reversing stress fatigue spectrum. The testing showed that microcracking can occur in the aluminum matrix material and that additional testing is necessary. A manufacturing plan and a production cost estimate were made for a canard with boron/aluminum skins and titanium substructure. GRA

N75-25926# Trans-Sonics, Inc., Burlington, Mass.
HELICOPTER LIFT MARGIN SYSTEM Final Report
Bradford W. Edgerton and Sidney B. Williams Dec. 1974 48 p refs
(Contract N00014-72-C-0001; NR Proj. 213-067)
(AD-A003917; Rept-80003; JANAIR-731003) Avail: NTIS CSCL 01/3

Helicopter power requirements are generally maximum when hovering out of ground effect. Thus, takeoff and landing maneuvers are the most critical, since the power requirements may not be clear to the pilot at the time he must make the corresponding decisions. Power deficiencies at takeoff or landing are very hazardous. To maximize safety of takeoff and landing operations, a system has been devised which presents to the pilot his lift margin, a figure which represents the excess weight which could be accommodated under locally-existing barometric pressure, outside-air-temperature conditions, and engine and rotor system conditions. GRA

N75-25927# Georgia Inst. of Tech., Atlanta. School of Engineering Science and Mechanics.
MINIMUM WEIGHT DESIGN OF FUSELAGE TYPE STIFFENED CIRCULAR CYLINDRICAL SHELLS SUBJECT TO UNIFORM AXIAL COMPRESSION
George J. Simitses and Variddhi Ungbhakorn Aug. 1974 147 p refs
(Grant AF-AFOSR-2655-74; AF Proj. 9782)
(AD-A004412; AFOSR-75-0137TR) Avail: NTIS CSCL 01/3

This report contains a technical procedure by which one may design a fuselage-type stiffened thin circular cylindrical shell to carry safely a specified uniform axial compression with minimum weight. GRA

N75-25928# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INVESTIGATION OF THE DEPARTURE MODES OF A F-4D AIRCRAFT FROM A STEADY SIDESLIP FLIGHT CONDITION M.S. Thesis
Max L. Hawkins Dec. 1974 138 p refs
(AD-A004795; GAE/MC/74-6) Avail: NTIS CSCL 01/1

This study consisted of modeling the motion of an F-4D with both the linear and non-linear equations of motion. The characteristic roots of the linear equations were first analyzed to predict the unstable flight conditions in the high angle of attack flight regime. The linear equations were then integrated to obtain a time history, and more explicit picture, of motion predicted by the characteristic roots when the aircraft is perturbed from the unstable condition. The validity of the linear equations is then checked and a more detailed picture of the nature of the motion obtained by numerically integrating the non-linear equations of motion at the same flight condition. GRA

N75-25929# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SEQUENTIAL ATTACK IN AERIAL COMBAT M.S. Thesis
Robert D. Powell Dec. 1974 71 p refs
(AD-A004796; GAE/MC/74-7) Avail: NTIS CSCL 01/3

The main features of a new system of aerial combat tactics, called sequential attack, are discussed. One of the primary maneuvers of this system, the pitchback, is modeled as a minimum time turn optimal control problem. Optimized trajectories are found by the ordinary gradient method using a realistic model of the F-4 aircraft. A simple rule of thumb is found which produces maneuvers whose final times differ from the optimal by less than one second over the region of principal interest. GRA

N75-25930# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE EFFECT OF ROLL RATE ON AIR COMBAT M.S. Thesis
James W. Tilley, II Dec. 1974 84 p refs
(AD-A004794; GAE/MC/74-4) Avail: NTIS CSCL 01/3

A study was made to determine the effects of roll rate on air combat. The effects of increased roll rate responses were analyzed by comparing various performance parameters at specific times during three maneuvers: the high speed yo-yo, the high speed barrel roll, and the low speed barrel roll. The parameters compared were: (1) the range between an attacking and defending aircraft; (2) the difference in specific energy between an attacking and defending aircraft; and (3) the velocity difference between the attacker and defender. GRA

N75-25931# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYTICAL DETERMINATION OF AIRCRAFT SPIN MODES M.S. Thesis
David L. Westgate Dec. 1974 77 p refs
(AD-A004798; GAE/MC/74-11) Avail: NTIS CSCL 01/3

Six non-linear equations of motion for a rigid body are used to model the aircraft's motion while in a spin. After applying the conditions for an equilibrium spin, the resulting six non-linear simultaneous equations are solved using a method that is accurate and well suited for use with a high-speed digital computer. The solution yields the equilibrium spin conditions and these solutions were usually obtained with less than three seconds of computer time. These results are compared with the results from previous prediction schemes. The linear characteristics of the aircraft about the equilibrium points are also presented. The model chosen for this study was a delta-wing fighter configuration. GRA

N75-25932# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN OF A DEPLOYABLE WING GLIDER M.S. Thesis

Phillip L. Abold Dec. 1974 77 p refs
(AD-A004800; GAE/MC/74D-1) Avail: NTIS CSCL 01/3

An unpowered, unguided vehicle to be deployed from a 4.75 inch flare tube was designed. The design criteria were: six cubic inch, two pound payload, minimum glide speed of 50 knots, and stable with particular emphasis on heading stability. Two basic configurations were considered in the analysis: the first was a tailless vehicle, and the second was a conventionally tailed vehicle. It was found that the tailless vehicle could not meet the stability requirements and thus the tailed vehicle was chosen to meet the design criteria. The analysis procedure consisted of a computer model to analyze vehicle stability, wind tunnel tests to calculate aerodynamic derivatives, and flight tests to demonstrate performance. The finalized vehicle had a folding wing and flexible tail-boom to meet the packaging requirement. The resulting vehicle had a glide ratio of 25 and was very stable in heading, while meeting all other design requirements. GRA

N75-25933# Naval Postgraduate School, Monterey, Calif.
INVESTIGATION OF THE A-7 HOOK POINT ATTACHMENT LOOSENING PROBLEM M.S. Thesis
Allen William Roessig, Jr. Dec. 1974 76 p refs
(AD-A004256) Avail: NTIS CSCL 01/3

Loosening of the hook point attachment bolt in the aircraft arresting hook assembly of the A-7 attack aircraft has caused a potentially dangerous situation and has demanded considerable maintenance effort. This report reviews the history of the loosening problem and attempted solutions to it. Research into a hitherto neglected possible causal mechanism, self loosening, is discussed. Experiments designed to evaluate the contribution of this new factor to the problem are reported. The conclusions drawn from these tests are: that loosening occurs as a result of plastic strain of the bolt, that the crushing of the washer also causes loss of torque, and that the existence or non-existence of a self loosening contribution could not be established. GRA

N75-25934# Bell Helicopter Co., Fort Worth, Tex.
APPLICATION OF ROTORCRAFT FLIGHT SIMULATION PROGRAM (C81) TO PREDICT ROTOR PERFORMANCE AND BENDING MOMENTS FOR A MODEL FOUR-BLADED ARTICULATED ROTOR SYSTEM Final Report, Jan. 1973 - Jul. 1974
F. D. Freeman and R. L. Bennett Nov. 1974 268 p refs
(Contract DAAJ02-72-C-0086; DA Proj. 1F1-63204-D-157)
(AD-A004015; BHC-299-099-691; USAAMRDL-TR-74-70)
Avail: NTIS CSCL 01/3

Four sets of model H-34 helicopter rotor blades were built and tested by the Sikorsky Aircraft Corporation. Rotorcraft Flight Simulation Program with Aeroelastic Rotor Representation, Program C81, was used to predict rotor performance and blade bending moments for comparison with the test results. Performance predictions made using the steady-state two-dimensional airfoil data (GFE) supplied by the Army for the model airfoils showed stall characteristics at much lower rotor lift levels than recorded in the tunnel test. Application of unsteady aerodynamic and yawed flow effects did not sufficiently improve the performance correlation. The lift and stall characteristics of the model rotor in the tunnel were found to be very similar to full-scale 0012 airfoil properties. GRA

N75-25935# Parsons of California, Stockton.
DESIGN CONCEPTS FOR HELICOPTER PALLETS AND GONDOLAS Final Report
C. Weber and R. Young Nov. 1974 179 p refs
(Contract DAAJ02-73-C-0058; DA Proj. 1F1-62203-AA-33)
(AD-A004013; USAAMRDL-TR-74-91) Avail: NTIS CSCL 01/3

This report presents the results of the design concepts investigation and preliminary design of externally suspended cargo pallets and/or gondolas to be utilized with the CH-47, CH-54, and HLH helicopters. Results of the investigation demonstrated that gondolas of two sizes could be coupled to develop full payload capacity of any of the three helicopters. The basic gondola was right rectangular to accommodate vehicles and equipment or break-bulk cargo if required. The investigation and supporting analyses eliminated pallets with lifting points at the base which make it both unstable and structurally inefficient. Therefore, pallets were not considered as a viable design concept. The gondola provides compatibility with ANSI/ISO geometry and can be transported with slings or other load acquisition equipment. GRA

N75-25936# Mechanical Technology, Inc., Latham, N.Y.
APPLICATION OF HIGH FREQUENCY RESONANCE TECHNIQUES FOR BEARING DIAGNOSTICS IN HELICOPTER GEARBOXES Final Technical Report
Mark S. Darlow, Robert H. Badbley, and G. W. Hogg Oct. 1974 177 p
(Contract DAAJ02-73-C-0086; DA Proj. 1F1-62205-A-119)
(AD-A004014; MTI-74TR25; USAAMRDL-TR-74-77) Avail: NTIS CSCL 01/3

The feasibility of the High-Frequency Resonance Technique (HFRT) for defect analysis of rolling-element bearings found in a UH-1 helicopter main transmission was demonstrated. A study was conducted to determine optimum conditions under which to test each bearing. These included accelerometer location, speed, load, housing design and detection frequency. The results provided general testing criteria for each bearing. An analytical and experimental bearing race resonance study was conducted on each bearing. The bearings were then mounted in a test rig and run at various speeds, loads and housing designs. Good bearings and bearings with artificially-induced discrete defects were run. GRA

N75-25937# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
QT-33A ESCAPE PERFORMANCE CAPABILITIES AND EVALUATION OF AIRCREW CHANGE 260 Final Report
Alan Cantor 21 Dec. 1973 47 p refs
(AD-A003467; NADC-73171-40) Avail: NTIS CSCL 01/3

On 19 January 1973 an ejection tower test program involving 15 live tests and 9 dummy tests was completed on the two wedge configurations tested. One pad was constructed by NAVAIRDEVCEN and was made of three layers of 1 inch thick ensolite (type AL6) tapered from the top and contoured for good spinal alignment. The second pad was a modified version of the NAVAIRDEVCEN pad which was supplied by Point Mugu. The top layer of ensolite was removed and replaced with a softer more compressible material (MILR-5001A type 2 soft, grade A). The test program was conducted from 6 to 12 G's, increasing the acceleration in 2 G increments and using three subjects. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-25938# Army Electronics Command, Fort Monmouth, N.J.
STABILIZED TERRAIN OPTICAL POSITION SENSOR (STOPS). A REPORT ON THE FY74 AVIONICS LABORATORY IN-HOUSE LABORATORY INDEPENDENT RESEARCH (ILIR) Final Research and Development Technical Report
C. M. Tsoubanos Dec. 1974 52 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A003842; ECOM-4283) Avail: NTIS CSCL 01/4

A concept of a self-contained hover position sensor and obstacle clearing device is derived by a stabilized mirror in pitch and roll. The mirror is set at an angle in front of a night vision system to provide the pilot with both adequate terrain presentation beneath as well as in front of the aircraft. This technique referred to as Stabilized Terrain Optical Position Sensor (STOPS) was enhanced by the superposition of displayed symbology with increasing information content conveying quantitative information. The concept was evaluated in a man-machine hybrid simulation. The results indicate that Hover Position accuracies of less than 5-feet RMS can be obtained by utilizing position information derived by STOPS and symbology representing ground velocity and acceleration. GRA

N75-25939# Farrand Optical Co., Inc., New York.
DEVELOPMENT OF AN ADVANCED DISPLAY FOR A WIDE FIELD NIGHT VISION SYSTEM Final Report, Jun. 1972 - Jun. 1974
A. R. Attler, M. Shenker, and A. Parr Jun. 1974 64 p
(Contract DAAK02-72-C-0538)
(AD-A003949; PTR-2115) Avail: NTIS CSCL 09/5

The program covers the design, development and test of a wide angle version of pupil forming Head-Up Display System. The unit was designed for installation in a UH-1 helicopter cockpit and has the following characteristics: 60 degrees horizontal by 33 degrees vertical field, 2.7 in. x 5.1 in. pupil located at 14 1/4 inches from a curved combiner; the weight is 55 lbs. The unit uses a rectangular CRT (7 in. x 4 1/8 in.) with a fiber optic faceplate having a 6 1/8 in. spherical radius focal plane. GRA

N75-26785 EMI Electronics Ltd., Feltham (England). Ergonomics Lab.
TWO WORLD DISPLAYS: HUMAN ENGINEERING ASPECTS
A. A. Clarke *In* AGARD Electro-Opt. Systems May 1975 8 p refs (For availability see N75-26778 17-70)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-25940 British Library Lending Div., Boston Spa (England).
THE DEVELOPMENT OF THE SINGLE-SHAFT GAS TURBINE
H. Maghon [1974] 28 p refs Transl. into ENGLISH from VGB Conf., Gas Turbines and Gas Turbine Operation 1973, Esslingen, West Ger., Mar./Apr. 1973
(BLL-CE-Trans-6396-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The development of simple single-shaft gas turbines with open cycle was investigated. In these turbines, the compression takes place without intermediate cooling and the combustion without intermediate combustion, and the compressor and turbine rotate at identical speeds. Flow rate, strength parameters, and cost analysis are also discussed. M.J.S.

N75-25941 British Library Lending Div., Boston Spa (England).
INFLUENCE OF AIR RELEASE CAPACITY OF TURBINE OIL ON TURBINE OPERATION
W. Aldrian [1974] 22 p refs Transl. into ENGLISH from VGB Kraftwerkstechnik (West Ger.), v. 53, Jul. 1973 p 456-463
(BLL-CE-Trans-6421-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The possible influence of the air release capacity, abbreviated to ARC, and the actual influence which an impaired ARC had on the operation of a 120 MW condensing turbo-alternator unit are described. In this case, the feeding of degassed oil from an existing opening in the bearing cover into the settling tank ceased pressure fluctuations immediately. Author

N75-25942# Shock and Vibration Information Center (Defense), Washington, D.C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 6, NO. 12
Dec. 1974 168 p refs
(AD-A003455) Avail: NTIS CSCL 20A

The various fan noise sources are discussed which are believed to be of significance in modern high bypass ratio engines. Such fans operate at both subsonic and supersonic tip speeds and these two operating regimes are discussed separately. The analytical techniques which have been evolved to calculate the noise are described. Both the classical and the more recently developed methods are considered. Author

N75-25943*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARTICULATE EXHAUST EMISSIONS FROM AN EXPERIMENTAL COMBUSTOR
Carl T. Norgren and Robert D. Ingebo Washington Jun. 1975 12 p refs
(NASA-TM-X-3254; E-8300) Avail: NTIS HC $3.25 CSCL 21E

The concentration of dry particulates (carbon) in the exhaust of an experimental gas turbine combustor was measured at simulated takeoff operating conditions and correlated with the standard smoke-number measurement. Carbon was determined quantitatively from a sample collected on a fiberglass filter by converting the carbon in the smoke sample to carbon dioxide and then measuring the volume of carbon dioxide formed by gas chromatography. At a smoke of 25 (threshold of visibility of the smoke plume for large turbojets) the carbon concentration was 2.8 mg carbon/cu m exhaust gas, which is equivalent to an emission index of 0.17 g carbon/kg fuel. Author

N75-25944*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBOFAN COMPRESSOR DYNAMICS DURING AFTERBURNER TRANSIENTS
Anatole P. Kurkov 1975 17 p refs Presented at the Symp. on Unsteady Phenomena in Turbomachinery, Monterey, Calif. 22-26 Sep. 1975; sponsored by AGARD Propulsion and Energetics Panel
(NASA-TM-X-71741; E-8375) Avail: NTIS HC $3.25 CSCL 21E

The effects of afterburner light-off and shut-down transients on compressor stability were investigated. Experimental results are based on detailed high-response pressure and temperature measurements on the Tf30-p-3 turbofan engine. The tests were performed in an altitude test chamber simulating high-altitude engine operation. It is shown that during both types of transients, flow breaks down in the forward part of the fan-bypass duct. At a sufficiently low engine inlet pressure this resulted in a compressor stall. Complete flow breakdown within the compressor was preceded by a rotating stall. At some locations in the compressor, rotating stall cells initially extended only through part of the blade span. For the shutdown transient, the time between first and last detected occurrence of rotating stall is related to the flow Reynolds number. An attempt was made to deduce the number and speed of propagation of rotating stall cells. Author

N75-25945*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
JET AIRCRAFT EMISSIONS DURING CRUISE: PRESENT AND FUTURE
J. S. Grobman 1975 15 p refs Presented at the 7th Aircraft Systems and Technol. Meeting, Los Angeles, 4-7 Aug. 1975; sponsored by AIAA
(NASA-TM-X-71750; E-8390) Avail: NTIS HC $3.25 CSCL 21E

Forecasts of engine exhaust emissions that may be practicably achievable for future commercial aircraft operating at high altitude cruise conditions are compared to cruise emission for present day aircraft. The forecasts are based on: (1) knowledge of emission characteristics of combustors and augmentors; (2) combustion research in emission reduction technology, and (3) trends in projected engine designs for advanced subsonic or supersonic commercial aircraft. Recent progress that was made in the evolution of emissions reduction technology is discussed. Author

N75-25946*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND TUNNEL MEASUREMENTS OF FORWARD SPEED EFFECTS ON JET NOISE FROM SUPPRESSOR NOZZLES AND COMPARISON WITH FLIGHT TEST DATA
Adolph Atencio, Jr. May 1975 10 p refs Presented at AIAA 8th Fluid and Plasma Dyn. Conf., Hartford, 16-18 Jun. 1975 Prepared in cooperation with Army Air Mobility R and D

Lab., Moffett Field, Calif.
(NASA-TM-X-62449; A-6054) Avail: NTIS HC $3.25 CSCL 20A

The results of a test program conducted in the NASA Ames 40- by 80-Foot Wind Tunnel to determine the effect of forward speed on the noise levels emanating from a conical ejector nozzle, a 32-spoke suppressor nozzle, and a 104-elliptical-tube suppressor nozzle are reported. It is shown that noise levels are reduced as forward speed is increased and that, for one suppressor configuration, forward speed enhances suppression. Comparisons of noise measurements made in the wind tunnel with those obtained in flight tests show good agreement. It is concluded that wind tunnels provide an effective means of measuring the effect of forward speed on aircraft noise. Author

N75-25947*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF CIRCUMFERENTIAL DISTORTION ON FAN PERFORMANCE AT TWO LEVELS OF BLADE LOADING
Melvin J. Hartmann and Nelson L. Sanger 1975 29 p refs Presented at the 45th Meeting of the Propulsion and Energetics Panel, Monterey, Calif., 22-26 Sep. 1975; sponsored by AGARD
(NASA-TM-X-71746; E-8385) Avail: NTIS HC $3.75 CSCL 21E

Single stage fans designed for two levels of pressure ratio or blade loading were subjected to screen-induced circumferential distortions of 90-degree extent. Both fan rotors were designed for a blade tip speed of 425 m/sec, blade solidity of 1.3 and a hub-to-tip radius ratio of 0.5. Circumferential measurements of total pressure, temperature, static pressure, and flow angle were obtained at the hub, mean and tip radii at five axial stations. Rotor loading level did not appear to have a significant influence on rotor response to distorted flow. Losses in overall pressure ratio due to distortion were most severe in the stator hub region of the more highly loaded stage. At the near stall operating condition tip and hub regions of (either) rotor demonstrated different response characteristics to the distorted flow. No effect of loading was apparent on interactions between rotor and upstream distorted flow fields. Author

N75-25948*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERIM PREDICTION METHOD FOR FAN AND COMPRESSOR SOURCE NOISE
M. F. Heidmann Jun. 1975 83 p refs
(NASA-TM-X-71763; E-8398) Avail: NTIS HC $4.75 CSCL 21E

A method is presented for interim use in assessing the noise generated by fans and compressors in turbojet and turbofan engines. One-third octave band sound pressure levels consisting of broadband, discrete tone, and combination-tone noise components are predicted. Spectral distributions and directivity variations are specified. The method is based on that developed by other investigators with modifications derived from an analysis of full-scale, single-stage fan data. Comparisons of predicted and measured noise performance are presented, and requirements for improving the method are discussed. Author

N75-25949# Avco-Everett Research Lab., Everett, Mass.
FIELD TESTS OF A LASER RAMAN MEASUREMENT SYSTEM FOR AIRCRAFT ENGINE EXHAUST EMISSIONS Final Technical Report
Donald A. Leonard Oct. 1974 181 p refs
(Contract F33615-71-C-1875; AF Proj. 3066)
(AD-A003648; AFAPL-TR-74-100) Avail: NTIS CSCL 07/4

Laser induced Raman and fluorescence measurements were made in the exhaust of a T53-L13A gas turbine engine with a new field portable instrument devised specifically for gas turbine exhaust emission measurements. The gas turbine exhaust was analyzed by conventional instruments for CO, CO2, NO, NOx, total hydrocarbons, smoke and temperature, and these data were used as a calibration standard for the evaluation of the laser Raman instrument. The most severe problem area was laser induced hydrocarbon fluorescence when the exhaust contained large total hydrocarbon concentrations. The overall conclusion was that the laser Raman method shows a good potential for aircraft gas turbine emission analysis. GRA

N75-25950# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
MODIFIED CENTRIFUGAL COMPRESSOR Final Report, 23 Oct. 1973 - 23 Jul. 1974
Gary B. Reeves and Jeffrey K. Schweitzer Nov. 1974 83 p (Contract DAAJ02-74-C-0003; DA Proj. 1G2-62207-AH-89) (AD-A004002; PWA-FR-6583; USAAMRDL-TR-74-96) Avail: NTIS CSCL 21/5

A single-stage centrifugal compressor designed to produce a 10:1 pressure ratio at a flow rate of 3.2 lb/sec was tested. An earlier version of this compressor was tested under USAAMRDL Contract DAAJ02-70-C-0006 and was found to have excessive losses in the tandem inducer. In addition, diffuser damage was incurred during that testing, which also prevented the achievement of the full design potential. The objective of this follow-on program was therefore to demonstrate improved performance for the 10:1 pressure ratio single-stage centrifugal compressor with a modified inducer and a new (undamaged) diffuser. Modifications to the design of the inducer were made to improve its high-speed (Mach number) performance and to decrease the required inlet prewhirl, and a test program was conducted to obtain overall and inducer performance data. GRA

N75-25951# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
EXPLORATORY INVESTIGATION OF PHOTOCHEMICAL IGNITION FOR TURBINE ENGINE COMBUSTORS Final Technical Report, 1 Mar. 1973 - 31 Jul. 1974
E. V. Zettle Oct. 1974 61 p refs
(Contract F33615-73-C-2063; AF Proj. 3066)
(AD-A003647; R74-AEG393; AFAPL-TR-74-87) Avail: NTIS CSCL 21/2

An exploratory program was conducted to evaluate the photochemical ignition concept in standard General Electric combustor test rigs using igniters supplied by Photochem Industries, Inc. A basic objective of this program was to determine the minimum energy input requirements for ignition of an F101 combustor with an ultraviolet light source. A total of 34 ignition attempts were made with a total of fourteen Photochem Industries igniters. The majority of the testing was conducted at simulated ground start operating conditions. The igniter energy input level was varied from 5 to 150 joules. The energy pulsing was varied from one pulse up to 80 pulses at a 2 per second rate; i.e., a single pulse was applied for some tests, and multiple pulses were applied for some tests. GRA

N75-25952# Dayton Univ. Research Inst., Ohio.
MODIFICATIONS TO COMPRESSOR TEST DATA ANALYSIS PROGRAM UD0200 Technical Interim Report, Oct. 1973 - Jun. 1974
Richard M. Hearsey Nov. 1974 89 p refs
(Contract F33615-74-C-4030; AF Proj. 7065)
(AD-A004182; UDRI-TR-74-26; ARL-74-0131) Avail: NTIS CSCL 21/5

This report describes a slightly modified form of a previously published computer program that is designed for the analysis of single-stage axial compressor data. A special feature of the original program was the option to compute annulus blockage fractions such that experimentally determined casing data pressures would be matched by the computed values. The revised program extends this concept to include the option to compute relative flow deviation angles instead of blockage such that the same static pressure match is achieved. Also, experimental static pressure may be specified to the calculation at any radius in the flowfield rather than only on the casing. A number of other less significant changes to the program are also recorded. GRA

N75-25953# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
INVESTIGATION OF SURFACE TENSION SCREENS FOR USE IN RAMJET FUEL SYSTEMS Final Report, Jan. - Jul. 1973
Jack R. Fultz Oct. 1974 69 p refs
(AF Proj. 3012)
(AD-A004098; AFAPL-TR-74-29) Avail: NTIS CSCL 21/5

This report presents an analysis of surface tension screens for their applicability to fuel systems in ramjet-powered vehicles.

Selection of surface tension screens for fuel expulsion over other expulsion techniques was made on the basis of their high temperature capability, moderate pressure requirements, geometrical considerations, simplicity (no moving parts), and other factors. Analysis of the pressure losses encountered in expelling the heavy hydrocarbon fuel (RJ-5) used in this study revealed that the primary pressure loss in the system was encountered in flowing the fuel through the surface tension screen. The time required to expel fuel from various trap tank sizes was calculated as a function of fuel flow rate. Parameters investigated in addition to trap tank size included orifice vent area and acceleration (g's) force. GRA

N75-25954# School of Aerospace Medicine, Brooks AFB, Tex.
CRYOGENIC SAMPLING OF TURBINE ENGINE EXHAUST Progress Report, May - Dec. 1973
James P. Conckle, William W. Lackey, and Richard L. Miller Nov. 1974 13 p
(AF Proj. 7164)
(AD-A003627; SAM-TR-74-54) Avail: NTIS CSCL 14/2

A multistage cryogenic trapping system was used to sample and concentrate organic constituents from turbine engine combustor exhaust. Analyses were conducted by a gas chromatograph-mass spectrometer coupled with a data acquisition system. A 30-minute sample collection, although inadequate for quantitative analysis of individual compounds, showed significant differences in the character of organic compounds in T-56 combustor exhaust between neat fuels and fuels containing organometallic smoke-abatement additives. GRA

N75-25955# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
COMMUNITY NOISE EXPOSURE RESULTING FROM AIRCRAFT OPERATION: APPLICATION GUIDE FOR PREDICTIVE PROCEDURE Final Report
Dwight E. Bishop Nov. 1974 111 p refs
(Contract F33615-73-C-4160)
(AD-A004818; BBN-2582; AMRL-TR-73-105) Avail: NTIS CSCL 20/1

This report is one of a series describing the research program undertaken by the Aerospace Medical Research Laboratory to develop procedures for predicting the community noise exposure resulting from aircraft operations. It discusses the applications of the procedure to the aircraft noise-related problems facing master planners, civil engineers, environmentalists, etc., as well as the management people concerned with operating an air base. Examples are given of use of the procedure in terms for land planning, operational applications at air bases and basic aircraft design. GRA

N75-25956# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF TECHNOLOGICAL TOLERANCE ON GAS TURBINE PARAMETERS
A. E. Tunakov and Yu. A. Rzhavin 27 Nov. 1974 16 p Transl. into ENGLISH from Tr. Aviats. Inst. (Kazan), no. 133, 1971 p 82-89
(AD-A004349; FTD-HC-23-1487-74) Avail: NTIS CSCL 21/5

A mathematical model of a turbine stage cell is devised such that for any operational condition, all the basic parameters of the turbine can be determined. Solution to the problem was carried out with the usually employed assumptions of turbomachine theory. GRA

N75-25957# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SIGNAL INDICATOR OF THE OSCILLATIONS OF THE IMPELLER BLADES OF TURBOMACHINE
I. E. Zablotskii and Yu. A. Korostelev 6 Dec. 1974 16 p refs Transl. into ENGLISH from the Russian patent no. 236825 (3 February 1974) p 1-4
(AD-A004680; FTD-MT-24-2836-74) Avail: NTIS CSCL 21/5

A device is proposed for the detection of vibrations of turbomachine blades. The signal detector is comprised of a coincidence circuit and a delay multivibrator for increased reliability. Block diagrams are included. J.M.S.

N75-25958# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
UNSTEADY FLOW IN JET ENGINES
F. O. Carta, ed. Nov. 1974 495 p refs Presented at a workshop at United Aircraft Research Laboratories, 11-12 Jul. 1974; sponsored by project SQUID, AFOSR, and UARL
(Contract N00014-67-A-0226-0005)
(AD-A003853) Avail: NTIS CSCL 21/5

The report records papers and discussions presented at a symposium relative to the fluid mechanics and dynamics of jet engines. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-25959 Stanford Univ., Calif.
SELECTION OF SAMPLING RATE FOR DIGITAL CONTROL OF AIRCRAFTS Ph.D. Thesis
Paul Katz 1975 242 p
Avail: Univ. Microfilms Order No. 75-13537

The considerations in selecting the sampling rate for a digital control of aircrafts are identified and evaluated. Optimal discrete synthesis is the design method used. Due to discretization of the continuous plant this method of design does not introduce an artificial limitation on the sampling rate. The principal example used is the short period mode of a hypothetical high performance aircraft. The assumed model includes a bending mode and wind gusts. Major factors which influence the selection of the sampling rate are identified and investigated: (1) the time response to control inputs; (2) the response to an external disturbance; (3) the sensitivity to variation of parameters; and (4) the roughness of the response to control inputs. It was found that the limiting factors in the selection of the sampling rate for the example are the time response to a control input, and the response to an external disturbance. Dissert. Abstr.

N75-25960*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RECURSIVE IDENTIFICATION AND TRACKING OF PARAMETERS FOR LINEAR AND NONLINEAR MULTIVARIABLE SYSTEMS
Menahem Sidar May 1975 39 p refs
(NASA-TM-X-62446; A-6115) Avail: NTIS HC $3.75 CSCL 01C

The problem of identifying constant and variable parameters in multi-input, multi-output, linear and nonlinear systems is considered, using the maximum likelihood approach. An iterative algorithm, leading to recursive identification and tracking of the unknown parameters and the noise covariance matrix, is developed. Agile tracking, and accurate and unbiased identified parameters are obtained. Necessary conditions for a globally, asymptotically stable identification process are provided; the conditions proved to be useful and efficient. Among different cases studied, the stability derivatives of an aircraft were identified and some of the results are shown as examples. Author

N75-25961# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Abteilung Luftfahrtpsychologie.
COCKPIT-SYSTEM STUDY YAK 40. A PILOT OPINION SURVEY TO THE AIRCRAFT HANDLING AND SYSTEM QUALITIES
Konrad Steininger and Guenter Neumann 2 Jan. 1975 72 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verkehr
(DLR-FB-75-15) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 24,90 DM

A representative sample of pilots employed with an airline operating the Russian short haul jet transport aircraft YAK 40 assessed the acceptability of the cockpit layout and instrumentation, the handling quality, and the feasibility of the systems with regard to the pilot's workload. The assessment of the

concerned qualities was quantitatively conducted by using a 7-scale rating of 82 items of a questionnaire, and qualitatively by tape-recorded descriptions of critical experiences with the aircraft. The method of subjective assessment, rating, and description of a system was used to find the critical weakness and the favorable points of an aircraft-operation. It is a heuristic approach towards a direct recognition of the strain and attention needed to cope with the operation of the aircraft.
Author (ESRO)

N75-25962# Lear Siegler, Inc., Oklahoma City, Okla. Management Services Div.
FLIGHT CONTROL ACTUATOR SYSTEM DEVELOPMENT Final Report, 24 Nov. 1972 - 18 Dec. 1973
Dale G. Bazill, Harry S. Schreadley, and B. H. Earley Aug. 1974 225 p
(Contract F33615-73-C-3024; AF Proj. 8225)
(AD-A004853; AFFDL-TR-74-82) Avail: NTIS CSCL 01/3

This report describes the following research tasks: The test and evaluation of a quadruplex redundant Pitch Axis Test Rig (PATR) to fully describe the hydraulic, mechanical and electronic technology contained therein; and the design of a Roll Axis Test Rig (RATR) to permit hardware simulation of quad redundant, force sharing, active standby, median select and split surface flight control system mechanizations that have high dynamic response.
GRA

N75-25963# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STABILITY ANALYSIS OF AN F-4C AIRCRAFT IN STEADY LEVEL TURNING FLIGHT M.S. Thesis
Richard J. Rudolph Dec. 1974 74 p refs
(AD-A004797; GAE/MC/74-9) Avail: NTIS CSCL 01/3

A stability analysis of an F-4C aircraft (SAS off) in a coordinated, constant velocity, steady level turn is performed. The linearized nondimensional equations of motion were used to solve for equilibrium positions about the steady turn and for the resulting aircraft motions. Five flight regions were investigated to determine the effects of altitude and speed variations for load factors ranging from 1.0 to 3.0 in 0.5 increments. Root locus plots and Argand diagrams are employed to isolate and identify three complex motions. Results indicate adverse dutch rolling motion present at moderate load factors for several flight regions.
GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N75-25964# National Aviation Facilities Experimental Center, Atlantic City, N.J.
RELIABILITY ANALYSIS OF THE SYSTEM MAINTENANCE MONITOR CONSOLE Final Report, Sep. 1972 - Dec. 1974
Arthur R. Moss Mar. 1975 97 p
(AD-A008383; FAA-NA-74-53; FAA-RD-75-3) Avail: NTIS HC $4.75 CSCL 14/2

The specification for the system maintenance monitor console (SMMC) calls for a minimum mean uptime (MUT) of 5,000 hours and a maximum mean downtime (MDT) of 1 hour for each SMMC module type. Formal MUT and MDT tests were performed in accordance with approved test plans. All module types passed the tests. An independent MUT analysis covering 3.75 equipment years of observation showed, with an 80-percent degree of confidence, that the true MUT's of all module types except the 9020E-1 are greater than 9,000 hours. The corresponding MUT for the 9020E-1 may be as low as 4,500 hours. The type 247 subminiature lamps used in the projection readout indicators (PRI's) failed at an average of two lamps per day per SMMC. Comparative life tests were performed between the type 247 and three alternative type lamps, types 6180, 714, and 685. Types 714 and 685 showed significantly greater mean lives but lower luminosities than the 247. Human factors studies are planned to determine the suitability of using lamps of lower luminosity.
Author

N75-25965*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SIMULATOR FOR PRACTICING THE MATING OF AN OBSERVER-CONTROLLED OBJECT WITH A TARGET Patent Application
Walter J. Polstorff, inventor (to NASA) Filed 25 Jun. 1975 23 p
(NASA-Case-MFS-23052-1; US-Patent-Appl-SN-590183) Avail: NTIS HC $3.25 CSCL 14B

A description is given of a simulator by which an observer, viewing both a target and an object under his control, can practice mating the object with the target. The target replica is coded along one coordinate axis in such a way that the distance of an elemental area on the target along the axis is capable of being remotely readout by a television camera. The code is by way of a variation in color, in brightness or a combination of color or brightness. A third television camera responsive to the code provides information by which a target range signal is generated for each picture element of the scene televised by the target camera. The computer calculates an object range signal for each picture element of the scene televised by the object camera, and a comparator compares range signals for corresponding picture elements of both scenes in order to determine which camera is to be blanked from the monitor in order to create the illusion that one or the other of the target and the object is closer to the observer.
NASA

N75-25966*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STATIC COEFFICIENT TEST METHOD AND APPARATUS Patent Application
Carl L. Haehner and John L. Tarpley, Inventors (to NASA) Filed 9 Jun. 1975 18 p
(NASA-Case-GSC-11893-1; US-Patent-Appl-SN-585420) Avail: NTIS HC $3.25 CSCL 14B

A method and apparatus is described for determining the static coefficient of friction between contacting surfaces of a plurality of bodies. A flexible filament fixedly connected to one of the bodies is alternately and cyclically tensioned and relaxed in response to another of the bodies being moved at constant velocity relative to a fixed portion of the filament. Coefficients of friction for contacting surfaces under high compressive loads up to 600 psi are determined by utilizing a test fixture including a calibrated compression spring that exerts a normal force on the contacting surfaces.
NASA

N75-25967# Rome Air Development Center, Griffiss AFB, N.Y.
FAA LIGHTNING PROTECTION STUDY: LIGHTNING PROTECTION FOR STATUS AND CONTROL LINES OF AN/GRN-27(V) INSTRUMENT LANDING SYSTEM Final Report, 1 Jan. 1974 - 1 Feb. 1975
Gene K. Huddleston Feb. 1975 26 p refs
(Contract DOT-FA72WAI-356)
(AD-A006997; FAA-RD-75-24) Avail: NTIS HC $3.75 CSCL 01/5

Specific recommendations for the protection of the AN/GRN-27 (5) instrument landing system from lightning-induced transients on the buried control cables comprising the status and control lines of the system are presented. Avalanche diode transient voltage suppressors in leadless packages are the recommended protection devices.
Author

N75-25968*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
EVALUATION OF THE NASA AMES NO. 1 7 BY 10 FOOT WIND TUNNEL AS AN ACOUSTIC TEST FACILITY
John F. Wilby and Terry D. Scharton 30 Jun. 1975 135 p refs
(Contract NAS2-8382)
(NASA-CR-137712; BBN-2936) Avail: NTIS HC $5.75 CSCL 14B

Measurements were made in the no. 1 7'x10' wind tunnel at NASA Ames Research Center, with the objectives of defining

the acoustic characteristics and recommending minimum cost treatments so that the tunnel can be converted into an acoustic research facility. The results indicate that the noise levels in the test section are due to (a) noise generation in the test section, associated with the presence of solid bodies such as the pitot tube, and (b) propagation of acoustic energy from the fan. A criterion for noise levels in the test section is recommended, based on low-noise microphone support systems. Noise control methods required to meet the criterion include removal of hardware items for the test section and diffuser, improved design of microphone supports, and installation of acoustic treatment in the settling chamber and diffuser. Author

N75-25969# Science Applications, Inc., Albuquerque, N. Mex.
STUDY OF RUNWAY DEFORMATION CONTOURING USING HOLOGRAPHIC TECHNIQUES Final Report, Jan. 1973 - Jan. 1974
C. G. Murphy Nov. 1974 131 p refs
(Contracts DNA001-73-C-0041; DOT-FA-73WAI-361)
(AD-A003673; SAI-73-510-AQ; AFWL-TR-73-282; FAA-RD-74-24) Avail: NTIS CSCL 01/5

This work is designed to show that the modern optics methods of holography and moire for deformation measurements are applicable in the field. The holographic methods described are general holography, holographic interferometry by double exposure, live fringe and constant amplitude vibration, holographic contouring by the dual frequency, dual-source and dual-index methods. Moire methods of producing contours for topology and deformations are described which use the holographic contouring and grid projection techniques. Experimental techniques are given for each of these methods and the suitability of each for field use is evaluated in terms of key parameters. Two laboratory experiments are presented to demonstrate the technologies involved in holographic and moire deformation contouring. Recommendations for a modular approach to producing a deformation contouring device are given. GRA

N75-25970# Air Force Academy, Colo.
SELF-ERECTING STRUCTURE Final Report, 12 Feb. - 31 Dec. 1973
George E. Cannon, Jr. Dec. 1974 27 p refs
(AF Proj. 6110)
(AD-A003490; AFWL-TR-74-133) Avail: NTIS CSCL 13/13

Relocatable structures frequently require heavy equipment for erection and involve hundreds of man-hours for construction. The need for heavy equipment can be eliminated and the construction time decreased by making the basic modules of the building small enough to be placed manually, by connecting all parts of the structure while they are still at ground level, and by raising the building by some means not requiring high-lift machinery. A model structure has been developed, consisting of prefabricated modules which are easily joined to form a 32-foot long horizontal structure capable of raising itself to form a 20-foot diameter arch. Methods for simultaneously erecting many such arches to form an entire building were examined. A weather covering which can be attached prior to erection and methods of locking all joints in the structure after erection were developed. GRA

N75-25971# IIT Research Inst., Chicago, Ill.
MULTIPATH ENVIRONMENT EVALUATION Final Report, May - Nov. 1974
A. E. Brindley, L. C. Calhoun, and T. N. Patton Nov. 1974 541 p refs
(Contract F33615-72-C-1024; AF Proj. 404L)
(AD-A004432; AFFDL-TR-74-150) Avail: NTIS CSCL 17/7

This report describes an experimental program aimed at evaluating the multipath environment typical of that which will challenge C-band microwave landing systems. The report describes the ground and air testing conducted in the Area B complex of Wright-Patterson Air Force Base, Ohio, and includes a wealth of data gathered with the aid of MLS hardware used on the prior phase of this program. A substantial fraction of the effort was devoted to measurements made on a large reflecting screen used by FAA in the test phase of Phase II of the National Landing Plan. It is concluded from the data gathered at Wright-Patterson AFB, that multipath signals generated by the use of the screen in isolation (as at NAFEC and Wallops) are quite dissimilar to those observed from real-life structures in their spatial characteristics. It is further concluded that typical hangars have quite similar reflection-characteristics, almost independent of their constructional details. GRA

N75-25972# Stanford Research Inst., Menlo Park, Calif.
SHOCKTUBE FOR BLAST-FIRE INTERACTION STUDIES Final Report
Stanley B. Martin, Charles J. Cook, and Thomas Goodale 30 Aug. 1974 68 p
(Contract DAHC20-72-C-0406; SRI Proj. PYU-2026)
(AD-A003929) Avail: NTIS CSCL 18/3

This summary report covers DCPA Contract DAHC20-C-0406 for R and D work aimed at developing a prototype shocktube facility for the study of blast-fire interactions and evaluating the practical utility of the concept by simulating the interactions between blast and fire in an urban target. GRA

N75-25973# North Carolina State Univ., Raleigh.
AN EXPERIMENTAL INVESTIGATION OF LATE-STAGE EQUIVALENCE FOR THE AXIAL HYPO- AND HYPERVELOCITY IMPACT OF RODS
J. J. Kelly and R. A. Douglas Nov. 1974 93 p refs
(Contract N00014-68-A-0187; NR Proj. 064-504)
(AD-A003904; Rept-74-3) Avail: NTIS CSCL 19/4

This report describes the development of a diffraction-grating strain-measurement system capable of measuring axial surface strains in target rods experiencing axial hypo- and hypervelocity impact and its subsequent application to evaluate the existence of the late-stage equivalence principle for this impact configuration. GRA

N75-25974# Arizona Univ., Tucson. Optical Sciences Center.
IMPROVED BLACKBODY SIMULATOR Final Report, Aug. 1972 - Mar. 1974
W. L. Wolfe and F. O. Bartell Jun. 1974 197 p refs
(Contract F04701-72-C-0401; ARPA Order 1629)
(AD-A003823) Avail: NTIS CSCL 14/2

Blackbody simulators are commonly used for standards and test equipment in infrared measurement programs. However, advances in infrared technology have required improved accuracy for infrared standards used in high-vacuum, low-temperature environments. The study covered cavity shape, core material, cavity wall coating, temperature uniformity, emittance uniformity, temperature measurement and control, attenuation and calibration methods, optical analysis and design, NBS traceable calibration, and fabrication methods. The results of the study led to the design and fabrication of the Improved Blackbody Simulator. Over-all performance characteristics include temperature stability and control of about 50 mK, temperature uniformity of about 1 K, and spectral radiance accuracy of about 0.5% or better. The Improved Blackbody Simulator was delivered to AEDC for use in the 7V Chamber Infrared Simulator. GRA

N75-25975# Naval Aerospace Medical Research Lab., Pensacola, Fla.
A PRIMATE RESTRAINT CHAIR FOR USE IN MICROWAVE RADIATION STUDIES
Vernon R. Reno, John O. DeLorge, George D. Prettyman, Clayton S. Ezell, and Toby A. Griner 11 Sep. 1974 15 p refs
(AD-A003948; NAMRL-1211) Avail: NTIS CSCL 06/18

A restraint chair has been developed for use with subhuman primates in microwave research. The chair is essentially nonreflective, causing minimal perturbation of the field incident on the restrained animal. GRA

N75-25976# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE Z-AT-17.5/3 SIBERIAN SCIENTIFIC RESEARCH INSTITUTE FOR ENERGETICS (SIBNIIE) WIND TUNNEL FOR STUDY OF THE ENVIRONMENT
V. A. Khokhlov 26 Nov. 1974 13 p Transl. into ENGLISH from Akad. Nauk SSSR. Sibirskoe Otd. Izv. Seriya Tekhn. Nauk, (USSR), no. 13, 1971 p 42-48
(AD-A004430; FTD-HC-23-1811-74) Avail: NTIS CSCL 14/2

A wind tunnel designed to study the interaction of structural units in the area with the environment is reported. Special

attention was given to processes transpiring in a wind flow around industrial, civil, and electricity producing units. E.H.W.

N75-25977# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID CHARACTERISTIC AT EDWARDS AIR FORCE BASE, CALIFORNIA Final Report, 1 Mar. 1973 - 31 May 1974
George D. Ballentine and Phil V. Compton Dec. 1974 26 p
(AD-A004463; AFWL-TR-172) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory (AFWL) standard skid resistance test conducted at Edwards AFB, California, on 18 to 25 March 1973 are analyzed. Results indicate the runway surface had good skid resistance properties, and no immediate corrective action was indicated at the time of the test. Reduced skid resistance properties at the 22 end of the runway indicated a need to program rubber removal. GRA

N75-25978# Illinois Univ., Savoy. Aviation Research Lab.
HOW MUCH SHOULD YOU PAY FOR THAT BOX?
Charles O. Hopkins Oct. 1974 10 p refs
(Contract F44620-70-C-0105)
(AD-A004148; ARL-74-11/AFOSR-74-6) Avail: NTIS CSCL 14/2

The report discusses the utility of flight and aircraft simulators, with reference to benefits, costs, applications, effectiveness, physical and psychological factors, and fidelity. Similator advantages are pointed out for advanced research and training. GRA

N75-25979# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF BEARING AND LUBRICANT TEST EQUIPMENT Final Report, Oct. 1973 - Sep. 1975
Russell D. Stockwell, John W. Kissel, G. L. Nessler, and W. D. Kaiser Sep. 1974 32 p refs
(Contract F33615-73-C-5087; AF Proj. 7343)
(AD-A004843; AFML-TR-73-242-Pt-2) Avail: NTIS CSCL 22/2

Two experimental apparatuses have been designed, constructed, and delivered to the Air Force Materials Laboratory. These apparatuses will be used to develop experimental data which can be used to devise accelerated life tests for bearings for mechanically despun antenna drive systems for Air Force communications satellites. The two apparatuses were designed for the purposes of studying lubricant torque variations and lubricant quantity in ball bearings operating in vacuum. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N75-25980*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: GUIDANCE AND CONTROL SYSTEMS: CSM SERVICE PROPULSION SYSTEM GIMBAL ACTUATORS
William A. McMahon Washington Jul. 1975 14 p
(NASA-TN-D-7969; JSC-S-444) Avail: NTIS HC $3.25 CSCL 22B

The service propulsion system gimbal actuators of the Apollo command and service module were developed, modified, and qualified between February 1962 and April 1968. The development of these actuators is described as the result of extensive testing, retesting, and modification of the initial design. Successful completion of each mission without anomalies attributable to the actuators indicated that the particular configuration (modification) in use was adequate for the flight profile imposed. Author

N75-25981*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: FLIGHT ANOMALY RESOLUTION
John D. Lobb Washington Jul. 1975 74 p refs
(NASA-TN-D-7968; JSC-S-412) Avail: NTIS HC $4.25 CSCL 22C

The identification of flight anomalies, the determination of their causes, and the approaches taken for corrective action are described. Interrelationships of the broad range of disciplines involved with the complex systems and the team concept employed to ensure timely and accurate resolution of anomalies are discussed. The documentation techniques and the techniques for management of anomaly resolution are included. Examples of specific anomalies are presented in the original form of their progressive documentation. Flight anomaly resolution functioned as a part of the real-time mission support and postflight testing, and results were included in the postflight documentation. Author

N75-25982*# Kanner (Leo) Associates, Redwood City, Calif.
TECHNOLOGY IN SPACE
I. T. Belyakov and Yu. D. Borisov Washington NASA Jul. 1975 282 p refs Transl. into ENGLISH of the book "Tekhnologiya v Kosmose" Moscow, Mashinostroyeniye Press, 1974 291 p
(Contract NASw-2481)
(NASA-TT-F-16264) Avail: NTIS HC $8.75 CSCL 22C

The results of Soviet and foreign research in the field of production in space are discussed. Methods for manufacturing and processing various types of materials, such as ball bearings, lenses, and crystals, and the behavior of the materials in space are described. Information on assembly and installation work including joining, sealing, welding, and soldering is given. Cost advantages and disadvantages of production in space are covered. Background material to help the reader understand the characteristics of outer space and the behavior of the human body in a state of weightlessness is also included. Author

N75-25983*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE FOR THE PEOPLE OF THE 20TH CENTURY
V. I. Sevastyanov Washington NASA Jun. 1975 7 p Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 2, Mar. - Apr. 1975 p 5-8
(Contract NASw-2481)
(NASA-TT-F-16437) Avail: NTIS HC $3.25 CSCL 22A

A report is made on the significance of space science for the people of the 20th Century. Particular attention is given to studies of earth from space as performed by the Soviet Salyut and American Skylab space stations. Author

N75-25984*# Scientific Translation Service, Santa Barbara, Calif.
WORK OF THE COSMONAUTS A. A. GUBAREV AND G. M. GRECHKO IN THE STATION SALYUT-4
Washington NASA Jun. 1975 10 p Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 2, Mar. - Apr. 1975 p 2-4
(Contract NASw-2483)
(NASA-TT-F-16438) Avail: NTIS HC $3.25 CSCL 22C

The operation of Soyuz 17 and Salyut 4 (after docking on 12 January 1975) is discussed. The scientific and technical program followed by the cosmonauts is described. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-25985# Academy of Sciences (USSR), Moscow.
APOLLO-SOYUZ TEST PROJECT
1975 204 p
Avail: NTIS HC $7.25 CSCL 22A

Information for the Press on the Apollo-Soyuz test consisting of two parts, and prepared by the U.S.S.R. and U.S.A. sides respectively, is presented. Both parts outline the purposes and program of the mission, the spacecraft design, the flight plan and information on joint and unilateral scientific experiments. Brief biographies of the cosmonauts and astronauts, the joint mission crew members, are also presented. The document covers technical support activities providing mission control and gives information on Soviet and American leaders. Author

N75-25986*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
A FEASIBILITY STUDY FOR SCOUT POLAR LAUNCHES FROM NASA WALLOPS FLIGHT CENTER Final Report, 10 Jun. 1974 - 25 Jan. 1975
T. R. Myler Washington NASA Jun. 1975 33 p
(Contract NAS1-12500)
(NASA-CR-2555) Avail: NTIS HC $3.75 CSCL 22A

The feasibility of launching the Scout vehicle into a polar orbit from Wallops Flight Center is discussed. The impact of proposed flights on vehicle hardware and range safety are defined. The launch and flight modes are described. Author

N75-25987*# National Aeronautics and Space Administration, Washington, D.C.
APOLLO-SOYUZ TEST PROJECT
1975 8 p
(NF-52/5-75) Avail: NTIS MF $2.25; SOD HC $0.30 CSCL 22A

Experiments proposed for the Apollo-Soyuz space mission are discussed. Data focus of space processing and manufacturing, earth surveys, and life sciences. Special efforts were made to test the compatibility of the rendezvous and docking systems for manned spacecraft. Mission planning programs, personnel training, and spacecraft modifications for both spacecraft are included. E.H.W.

N75-25988*# Tennessee Univ., Knoxville. Computing Center.
STUDY OF DATA ENTRY REQUIREMENTS AT MARSHALL SPACE FLIGHT COMPUTATION CENTER Final Report
Gordon R. Sherman 30 May 1975 47 p refs
(Contract NAS8-30879)
(NASA-CR-143882) Avail: NTIS HC $3.75 CSCL 22C

An economic and systems analysis of a data center was conducted. Current facilities for data storage of documentation are shown to be inadequate and outmoded for efficient data handling. Redesign of documents, condensation of the keypunching operation, upgrading of hardware, and retraining of personnel are the solutions proposed to improve the present data system. J.R.T.

N75-25989*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE NAVIGATION
I. K. Bazhinov, V. I. Aleshin, V. N. Pochukayev, and V. S. Polyakov Washington NASA Jul. 1975 388 p refs Transl. into ENGLISH of the book "Kosmicheskaya Navigatsiya" Moscow, Mashinostroyeniye Press, 1975 352 p
(Contract NASw-2481)
(NASA-TT-F-16370) Avail: NTIS HC $10.25 CSCL 22A

The theoretical principles of space navigation were studied. A theory for selection of a strategy of navigation measurements is presented, assuring maximum accuracy in determination of the parameters of motion under various assumptions concerning the nature of measurement error. The latest achievements in the area of the theory of correction of motion are discussed along with various criteria for control. Algorithms are presented for the solution of navigational problems using both ground-based and on-board electronic digital computers. Problems of assuring reliable convergence of iterational processes are discussed, and the area of application of recommended methods and algorithms is shown. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-25990# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
THEORETICAL INVESTIGATIONS ON THE COAXIAL ACCELERATOR WITH COMPRESSION COIL [THEORETISCHE UNTERSUCHUNGEN UEBER DEN KOAXIALEN BESCHLEUNIGER MIT KOMPRESSIONSSPULE]
Heribert Kuczera Mar. 1974 18 p refs In GERMAN Presented at the Meeting of the DGLR Comm. Magnetofluiddyn., Stuttgart, 20-21 Feb. 1974
(TUM-LRT-TB-18) Avail: NTIS HC $3.25

A coaxial plasma accelerator with a compression coil for accelerating glass spheres in the simulation of micrometeoroids was theoretically investigated. In particular, the plasmadynamic processes in the conical coil were studied by calculation of the current distribution and the magnetic field. An equivalent circuit is described. A computation method was developed permitting the layout of the current elements according to various models with a view to further parametric studies. ESRO

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-25991*# Michigan Univ., Ann Arbor. Radio Astronomy Observatory.
IMP-1 SATELLITE Final Scientific Report
Hector Alvarez Feb. 1975 5 p refs
(Contract NAS5-11174)
(NASA-CR-143807; UM/RAO-75-2) Avail: NTIS HC $3.25 CSCL 22B

Computer programs and procedures developed to process type 3 burst data obtained by IMP-6 are given. Data are primarily concerned with bursts that drift down to 130 kHz or lower. Graphical methods devised fit models to data are also considered. Burst time of arrival as well as direction of arrival were determined for several frequencies. E.H.W.

N75-25992# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
PLANNING AND DESIGN OF SPACECRAFT [ENTWURF UND AUSLEGUNG VON RAUMFAHRZEUGEN]
Robert H. Schmucker and Winfried M. Schauer 3 Aug. 1973 111 p refs In GERMAN
(TUM-LRT-TB-8) Avail: NTIS HC $5.25

A detailed study of the design and construction of autonomously propelled space vehicles, such as launch vehicles, interplanetary spacecraft and landing modules is presented. The following phases are described: mission planning, preliminary studies, selection of components, design of separate components and overall system, development and testing of separate components, integration, and first flight. ESRO

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-25993# Lockheed Missiles and Space Co., Palo Alto, Calif.
THERMAL MODE OF A SATELLITE: THE SELECTION OF THE HEAT REGULATION SYSTEM
V. E. Zelenin, A. I. Kopyl, P. A. Lataiko, and T. G. Chepur 1974 8 p ref Transl. into ENGLISH from the book "Kosmicheskaia Strela" Nauka, Moscow, 1974 p 132-138
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The two types of heat regulation systems for satellites are described as using either passive elements, which screen the emissive and absorptive properties and thermal resistivities of construction module surfaces, or active elements, which regulate the external radiant heat exchange and redistribute the thermal energy within the satellite by electromechanical devices. The comparative advantages of each element in overall efficiency and economy are discussed. A vacuum-screen heat insulation consisting of layers of aluminized polyethylene-terphthalate film separated by layers of glass veiling is presented as an effective passive element. Barrel-type shutters with a bimetal motor, two fans, an air duct, a clock-type program timer, and heat regulators are presented as effective active elements. A mathematical model calculated the satellite thermal mode and results were compared with telemetry data. L.B.

N75-25994*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A SPACE SHUTTLE VEHICLE FERRY CONFIGURATION AFTERBODY FAIRING OPTIMIZATION STUDY USING A 140A/B 0.0405-SCALE MODEL ORBITER (43-0) IN THE ROCKWELL INTERNATIONAL 7.75 BY 11.0 FT LOW SPEED WIND TUNNEL (OA124)
S. R. Houlihan (Rockwell International, Los Angeles) Jun. 1975 248 p
(Contract NAS9-13247)
(NASA-CR-141536; DMS-DR-2209) Avail: NTIS HC $7.50 CSCL 22B

Experimental aerodynamic investigations were conducted on a dual-strut mounted 0.0405-scale representation of the 140A/B outer mold line space shuttle orbiter vehicle. The tests, conducted from 11 Oct., 1974 through 22 Oct., 1974, were primarily to investigate aerodynamic stability and control characteristics of the space shuttle orbiter ferry configuration. Four afterbody fairing configurations and various additions to them in the form of horizontal and ventral fins strakes and other aerodynamic protuberances were tested. Base line data on the basic orbiter with MPS nozzles and bodyflap were recorded. The drag of the optimum ferry configuration was increased to the level of the basic orbiter for possible flight test configurations by the addition of two sizes of perforated speed brakes on the tail cone surface. Author

N75-25995*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
SPACE SHUTTLE ORBITER TRIMMED CENTER OF GRAVITY EXTENSION STUDY. VOLUME 1: EFFECTS OF CONFIGURATION MODIFICATIONS ON THE AERODYNAMIC CHARACTERISTICS OF THE 140 A/B ORBITER AT MACH 10.3
Peter T. Bernot Jun. 1975 130 p ref
(NASA-TM-X-72661) Avail: NTIS HC $5.75 CSCL 22B

Longitudinal and lateral-directional characteristics were obtained on several modified versions of the Rockwell International 140 A/B orbiter (0.010 scale). These modifications, designed to extend trim capability to center-of-gravity locations forward of the 65 percent fuselage station, consisted of two forebodies, two canard trimmers, and two body-wing fillets. Tests were performed over an angle-of-attack range of 12 to 36 degrees at a Reynolds number of 1.03 million based on body reference length. Data were obtained with the elevons and body flap deflected at the full-up and full-down design values. This investigation was conducted in the NASA Langley continuous flow hypersonic tunnel. Author

N75-25996*# Chrysler Corp., New Orleans, La. Space Div.
AN INVESTIGATION TO VERIFY THE STATIC STABILITY AND CONTROL EFFECTIVENESS OF THE 0.004 SCALE MODEL (74-0) OF THE SHUTTLE 5 ORBITER (0A108)
E. C. Allen (Rockwell International, Downey, Calif.) Jun. 1975 480 p
(Contract NAS9-13247)
(NASA-CR-141537; DMS-DR-2190) Avail: NTIS CSCL 22B

Results of wind tunnel tests of the 0.004 scale orbiter force model in the MSFC trisonic wind tunnel are presented. The stability and control characteristics of the shuttle vehicle 5 orbiter over a Mach number range of 0.6 through 4.96 are investigated along with model component effects, rudder, speed brake, elevator, aileron, and body flap effectiveness. Author

N75-25997*# City Coll. of the City Univ. of New York. Dept. of Electrical Engineering.
SYSTEMS ANALYSIS OF THE SPACE SHUTTLE Final Report, 17 Apr. 1974 - 18 Apr. 1975
Donald L. Schilling, Se Jeung Oh, and Fred Thau 17 Apr. 1975 196 p refs
(Contract NAS9-13940)
(NASA-CR-141887) Avail: NTIS HC $7.00 CSCL 22B

Developments in communications systems, computer systems, and power distribution systems for the space shuttle are described. The use of high speed delta modulation for bit rate compression in the transmission of television signals is discussed. Simultaneous Multiprocessor Organization, an approach to computer organization, is presented. Methods of computer simulation and automatic malfunction detection for the shuttle power distribution system are also described. D.M.L

N75-25998*# Lockheed-Georgia Co., Marietta.
SPACE SHUTTLE STRUCTURAL INTEGRITY AND ASSESSMENT STUDY Executive Summary, Jun. 1972 - Jul. 1974
Jul. 1974 19 p refs
(Contract NAS10-8018)
(NASA-CR-139181) Avail: NTIS HC $3.25 CSCL 22B

Potential nondestructive evaluation (NDE) requirements for the space shuttle vehicle during structural inspection in the refurbishment/turnaround period, are defined. Data are given on NDE limitations and defect characterization by the process. Special attention was given to the determination of fatigue cracks, stress corrosion cracks, corrosion, and adhesive disbonds of airframes. E.H.W.

N75-25999*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATIONS ON THE 0.004-SCALE MODEL 74-0 OF THE CONFIGURATION 4 (MODIFIED) SPACE SHUTTLE VEHICLE ORBITER IN THE NASA/MSFC 14-BY-14-INCH TRISONIC WIND TUNNEL (OA131)
M. E. Nichols (Rockwell International, Downey, Calif.) Mar. 1975 362 p refs
(Contract NAS9-13247)
(NASA-CR-141521; DMS-DR-2232) Avail: NTIS HC $10.00 CSCL 22B

The results of an oil flow boundary-layer visualization wind tunnel test of an 0.004-scale model of the Space Shuttle Vehicle Orbiter in the NASA/Marshall Space Flight Center 14-by-14-inch Trisonic Wind Tunnel are presented. The model was tested at Mach numbers from 0.60 through 2.75, at angles-of-attack from 0 through 25 degrees, and at unit Reynolds numbers from 5.0 to 7.0 million per foot. The test program involved still and motion picture photography of oil-paint flow patterns on the orbiter, during and immediately after tunnel flow, to determine areas of boundary layer separation and regions of potential auxiliary power unit exhaust recirculation during transonic and low supersonic re-entry flight. Author

N75-26000*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.

EFFECT OF DAMPING ON EXCITABILITY OF HIGH-ORDER NORMAL MODES Final Report

D. H. Merchant, R. M. Gates, and J. W. Straayer 30 May 1975 231 p refs

(Contract NAS8-30655)

(NASA-CR-143884; D180-18835-1) Avail: NTIS HC $7.50 CSCL 22B

The effect of localized structural damping on the excitability of higher-order large space telescope spacecraft modes is investigated. A preprocessor computer program is developed to incorporate Voigt structural joint damping models in a finite-element dynamic model. A postprocessor computer program is developed to select critical modes for low-frequency attitude control problems and for higher-frequency fine-stabilization problems. The selection is accomplished by ranking the flexible modes based on coefficients for rate gyro, position gyro, and optical sensor, and on image-plane motions due to sinusoidal or random PSD force and torque inputs. Author

N75-26001# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.

TRAJECTORY ESTIMATION OF HYBRID ROCKET BARBARELLA [EINE ABSCHAETZUNG DER FLUGBAHN DER HYBRIDRAKETE 'BARBARELLA']

Winfried M. Schauer Apr. 1974 34 p In GERMAN

(TUM-LRT-KB-3) Avail: NTIS HC $3.75

In order to estimate the attainable altitudes and ranges of the Barbarella I hybrid rocket when launched from a floating platform under an angle of at least 40 deg (to the vertical), a simplified trajectory calculation was carried out for varying propellant mass and launch angle. The calculation is based on the equations of motion and takes account of aerodynamic drag and thrust variation. Results are presented graphically and show that for launch angles of less than 20 deg it is favorable to fly maximum payload mass, and, for larger angles, it is necessary to fly minimum payload mass. ESRO

N75-26002# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.

FEASIBILITY OF AN INFRARED ASTRONOMY SATELLITE EXPERIMENT [ZUR DURCHFUEHRBARKEIT EINES INFRAROTASTRONOMIE-SATELLITENEXPERIMENTES]

R. Katterloher and K. Schwenzfeger 1 Jan. 1973 106 p refs In GERMAN; ENGLISH summary

(TUM-LRT-TB-1) Avail: NTIS HC $5.25

A possible configuration is described for the Infrared Astronomy Satellite, which shall perform astronomical observations in the infrared spectral region. The satellite is divided into two thermally separated substructures. One section contains a helium cooled telescope and measuring equipment; the other contains the complete satellite electronics. Two folding solar panels together with a storage battery provide the power supply. The experiment is protected against solar radiation by mirror panels which are expected to decrease the surface temperature to approximately 160 K. The satellite would fly in a retrograde near-polar circular orbit at 400 km and be synchronized to remain in the earths shadow for 40% of the orbital period. Helium vapor produced by cooling of the measuring equipment may be used for attitude control. The mass of the satellite is estimated to be 530 kg. Author (ESRO)

N75-26003# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.

A STUDY OF VERY HIGH ALTITUDE MANEUVERS USING AERODYNAMIC FORCES. VOLUME 1: SURVEY OF BASIC CONCEPTS AND THE PRINCIPAL RESULT Final Report, 2 Jan. 1971 - 2 Jan. 1974

Adolf Busemann and Robert D. Culp Sep. 1974 24 p refs

(Contract F33615-71-C-1103; AF Proj. 7071)

(AD-A004788; ARL-74-0104-Vol-1) Avail: NTIS CSCL 22/3

The University of Colorado, Department of Aerospace Engineering Sciences has conducted an extensive study of maneuvers using aerodynamic forces of vehicles at very high altitudes and orbital speeds. The results are contained in four volumes. This volume describes the assumptions and restrictions, summarizes the major results, and assesses the significance and the consequences of various parts of the study. GRA

N75-26004# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.

A STUDY OF VERY HIGH ALTITUDE MANEUVERS USING AERODYNAMIC FORCES. VOLUME 2: ON THE EFFECTS OF AERODYNAMIC FORCE AND CONTINUOUS THRUST IN VERY HIGH ALTITUDE MANEUVERS AT ORBITAL SPEEDS Final Report, 2 Jan. 1971 - 2 Jan. 1974

Adolf Busemann, Robert Dudley Culp, and Ching-Yew Yang Sep. 1974 71 p refs

(Contract F33615-71-C-1103; AF Proj. 7071)

(AD-A004789; ARL-74-0104-Vol-2) Avail: NTIS CSCL 22/3

Effects of aerodynamic forces on the flight path of a very high altitude, orbital velocity vehicle are considered. The magnitude of the aerodynamic force is assumed to be small compared with the gravitational force, thus restricting the analysis to altitudes above approximately 100 kilometers. Provision is made to account for the effects of continuous thrust of unlimited magnitude. Poisson series solutions, through first order, for the flight path as affected by the lift, drag and thrust are developed. Numerical examples for the particular case in which thrust and lift are always normal to the instantaneous plane of motion are presented. In the analysis a simple, accurate expression for the spherically disturbed density is derived. This density function is shown to reduce to previous, less accurate density functions as special cases. GRA

N75-26005# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.

PASSIVITY EXPERIMENTS ON HYDRAZINE FUELED SATELLITE PROPULSION SUBSYSTEMS Final Report

R. L. Doebler and E. T. Chang 3 Nov. 1974 30 p refs

(Contract F04701-74-C-0075)

(AD-A003753; TR-0075(5901-01)-2; SAMSO-TR-74-250) Avail: NTIS CSCL 22/2

The absence of a generally accepted state-of-art for conditioning or passivating monopropellant hydrazine satellite propulsion subsystems prompted the implementation of a small-scale program involving experimental and analytical efforts to assess the need for and effectiveness of procedures presently employed by contractors practicing the technique. GRA

N75-26006# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

OPTIMAL CONTROL OF A SOLAR RADIATION PRESSURE POWERED SPACE VEHICLE M.S. Thesis

John D. Cunningham Dec. 1974 50 p refs

(AD-A004792; GA/MC/74-10) Avail: NTIS CSCL 22/3

The restricted planar two-body dynamics case of a minimum time, Earth to Mars trajectory, by means of solar radiation pressure (solar sail) is investigated. The equations of motion and solar pressure values are derived. The gradient method of optimization is used to enforce convergence on a penalty function that includes all rendezvous constraints necessary at the final orbit. The angle between the sail and a radial vector from the sun is used as the control variable. Transit time is examined as a function of vehicle mass and sail area. The results of constant sail angle, variable sail angle, variable mass, and variable sail area are presented. GRA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-26007# Lockheed Missiles and Space Co., Palo Alto, Calif.
SOLID FUEL BALLISTIC MISSILES
A. M. Siniukov, L. I. Volkov, A. I. Lvov, and A. M. Shishkevich [1974] 442 p refs Transl. into ENGLISH from Voenizdat (Moscow), 1972
Avail: NTIS HC $11.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

A review of solid propellant technology with numerical analyses is presented. The theoretical principles of missile functioning as a whole are also discussed. Topics covered are: (1) mechanical and rheological properties of solid propellants, (2) solid propellant rocket motor design parameters, (3) missile design parameters such as structural mechanics and materials, (4) flight trajectory analyses and aerodynamic characteristics, and (5) missile subsystems and systems. Author

N75-26008*# Rocketdyne, Canoga Park, Calif.
LOW-SPEED INDUCERS FOR CRYOGENIC UPPER-STAGE ENGINES Final Report
W. R. Bissell, D. S. Jenkins, J. A. King, and E. D. Jackson May 1975 124 p refs
(Contract NAS8-29189)
(NASA-CR-143872; R-9655) Avail: NTIS HC $5.25 CSCL 21H

Two-phase, low-speed hydrogen and oxygen inducers driven by electric motors and applicable to the tug engine were designed and constructed. The oxygen inducer was tested in liquid and two-phase oxygen. Its head and flow performance were approximately as designed, and it was able to accelerate to full speed in 3 seconds and produce its design flow and head. The analysis of the two-phase data indicated that the inducer was able to pump with vapor volume fractions in excess of 60 percent. The pump met all of its requirements (duration of runs and number of starts) to demonstrate its mechanical integrity.
Author

N75-26009# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
HYBRID ROCKET ENGINES. INTERNAL BALLISTICS AND DESIGN [HYBRIDRAKETENTRIEBWERKE. INNENBALLISTIK UND AUSLEGUNG]
Robert H. Schmucker 3 May 1974 189 p refs In GERMAN Sponsored partly by Deut. Forschungsgemeinschaft
(TUM-LRT-DH-2) Avail: NTIS HC $7.00

A general study is presented on the interior ballistics and design of hybrid propellant rocket engines. Topics covered are: combustion physics, burning behavior, interior ballistics, hybrid propellant, and design and construction of hybrid rocket engines. ESRO

N75-26010# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
REALIZATION OF A DUAL THRUST PROGRAM FOR HYBRID ENGINES [ZUR REALISIERUNG EINES DOPPELSCHUBPROGRAMMES BEI HYBRIDTRIEBWERKEN]
Robert H. Schmucker 30 Mar. 1974 12 p refs In GERMAN (TUM-LRT-KB-2) Avail: NTIS HC $3.25

A method for the realization of a dual thrust program for a hybrid rocket engine similar to that of a solid propellant engine is discussed. In this case two concentric propellant charges of different burning rate were installed in the combustion chamber. The inner propellant has a high burning rate, the outer a low. The necessary relationships are derived using the basic hybrid propulsion equations. Two possibilities for control of the mixing ratio of both thrust stages are represented. It is shown that an optimal operation may be obtained in a simple manner. ESRO

N75-26011*# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
FLOW PROCESSES IN OVEREXPANDED CHEMICAL ROCKET NOZZLES. PART 1: FLOW SEPARATION [STROEMUNGSVORGAENGE BEIM BETRIEB UEBEREXPANDIERTER DUESEN CHEMISCHER RAKETENTRIEBWERKE, TEIL 1: STROEMUNGSABLOESUNG]
Robert H. Schmucker 3 Jul. 1973 61 p refs In GERMAN Sponsored partly by NASA, US Acad. of Sci. and Deut. Forschungsgemeinschaft
(NASA-CR-143044; TUM-LRT-TB-7) Avail: NTIS HC $4.25 CSCL 21H

An investigation was made of published nozzle flow separation data in order to determine the parameters which affect the separation condition. A comparison of experimental data with empirical and theoretical separation prediction methods leads to the selection of suitable equations for the separation criterion. The results were used to predict flow separation of the main space shuttle engine. ESRO

N75-26012# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
FLOW PROCESSES IN OVEREXPANDED CHEMICAL ROCKET NOZZLES. PART 2: SIDE LOADS BY A SYMMETRIC SEPARATION [STROEMUNGSVORGAENGE BEIM BETRIEB UEBEREXPANDIERTER DUESEN CHEMISCHER RAKETENTRIEBWERKE. TEIL 2: SEITENKRAEFTE DURCH UNSYMMETRISCHE ABLOESUNG]
Robert H. Schmucker 15 Sep. 1973 60 p refs In GERMAN (TUM-LRT-TB-10-Pt-2) Avail: NTIS HC $4.25

Methods for measuring the lateral forces, occurring as a result of asymmetric nozzle flow separation, are discussed. The effect of some parameters on the side load is explained. A new method was developed for calculation of the side load. The values calculated are compared with side load data of the J-2 engine. Results are used for predicting side loads of the space shuttle main engine. ESRO

N75-26013# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
FLOW PROCESSES IN OVEREXPANDED CHEMICAL ROCKET NOZZLES. PART 3: METHODS FOR THE AIMED FLOW SEPARATION AND SIDE LOAD REDUCTION [STROEMUNGSVORGAENGE BEIM BETRIEB UEBEREXPANDIERTER DUESEN CHEMISCHER RAKETENTRIEBWERKE. TEIL 3: METHODEN ZUR GEZIELTEN STROEMUNGSABLOESUNG UND SEITENKRAFTVERRINGERUNG]
Robert H. Schmucker 20 Sep. 1973 25 p refs In GERMAN (TUM-LRT-TB-11-PT-3) Avail: NTIS HC $3.25

Methods aimed at reduction of overexpansion and side loads as a result of asymmetric flow separation for rocket nozzles with a high opening ratio are described. The methods employ additional measures for nozzles with a fixed opening ratio. The flow separation can be controlled by several types of nozzle inserts, the properties of which are discussed. Side loads and overexpansion can be reduced by adapting the shape of the nozzle and taking other additional measures for controlled separation of the boundary layer, such as trip wires. ESRO

N75-26014# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
SIDE LOADS AND THEIR REDUCTION IN LIQUID ROCKET ENGINES
Robert H. Schmucker 1973 40 p refs Presented at the 24th Intern. Astronautical Congr., Baku, 7-13 Oct. 1973 Sponsored in part by US Natl. Acad. of Sci. and Deut.

Forschungsgemeinschaft
(TUM-LRT-TB-14) Avail: NTIS HC $3.75

A correlation of hot firing nozzle flow separation data with existing theories in side loads is presented, resulting in a simple method of estimating nozzle side loads. The tendency of a configuration to produce side loads and their approximate magnitudes is predicted. The model has additional value for the consideration of nozzle modifications to reduce side loads. Results of hot firing tests at NASA George C. Marshall Space Flight Center with these modifications are presented. ESRO

N75-26015# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
PRELIMINARY STUDY OF VARIOUS SPACE TUG PROPULSION SYSTEMS
Hans-L. Besser, Winfried M. Schauer, and Robert H. Schmucker 1973 40 p refs Presented at the 24th Intern. Astronautical Congr., Baku, 7-13 Oct. 1973
(TUM-LRT-TB-15) Avail: NTIS HC $3.75

Various stage configurations are evaluated and compared with propulsion systems presently in use. A sensitivity study indicates the parameters critically affecting the feasibility of the design. The estimation of performance considers the effect of a modified mission. Performance and cost can be used as criteria for the selection of an optimum space tug propulsion system. ESRO

N75-26016# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
HYBRID TUG: AN ALTERNATIVE CONCEPT FOR THE SPACE SHUTTLE [HYBRIDTUG - EIN ALTERNATIVKONZEPT FUER DEN RAUMSCHLEPPER]
Harry O. Ruppe, Winfried M. Schauer, and Robert H. Schmucker 13 Feb. 1974 63 p refs In GERMAN
(TUM-LRT-TB-17) Avail: NTIS HC $4.25

Several propulsion systems based on the fulfillment of space by criteria, were investigated and compared. These criteria include the possibility of an increased payload and limitation of launch facilities to LOX and liquid hydrogen supply. The results of these investigations show that a space tug with a LOX/CH2 hybrid propulsion system fits the criteria of a one-way mission and could be of interest for European development. ESRO

N75-26017# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
INFLUENCE OF DIFFERENT PARAMETERS ON THE STARTING BEHAVIOR OF HYBRID ENGINES [DER EINFLUSS VERSCHIEDENER PARAMETER AUF DAS ANFAHRVERHALTEN VON HYBRIDTRIEBWERKEN]
Robert H. Schmucker and Winfried M. Schauer 14 Apr. 1974 22 p refs In GERMAN
(TUM-LRT-TB-19) Avail: NTIS HC $3.25

A description is given of the quasisteady mass balance of the ignition process for hybrid rocket engines in order to determine criteria for ignition limits. An extinction effect which is a function of the ignition system design and the propellant combination can take place in these engines. The ignition process is described by a quasisteady mass balance with propellant evaporation taking account of oxidizer and propellant flow rate, enabling the ignition limit and the effect of parameters to be determined. ESRO

N75-26018# Massachusetts Inst. of Tech., Cambridge. Div. of Sponsored Research.
RESEARCH ON CHARGED ALKALI COLLOIDS FOR AEROSPACE VEHICLE AND GROUND BASED POWER GENERATORS Final Report, 23 Sep. 1968 - 23 Sep. 1971
Albert Solbes Oct. 1974 162 p refs
(Contract F33615-69-C-1114; AF Proj. 7116)
(AD-A004812; ARL-74-0125) Avail: NTIS CSCL 10/2

A thermodynamic study of two fluid EFD ejector generator systems is presented. A figure of merit is defined which allows comparison of various fluid combinations. An overall cycle optimization leads, for a mercury hydrogen system to efficiencies of the order of fifteen percent. Subsequently, various aspects of conversion process and its limitations are considered including: effect of space charge cloud divergence on generator performance, limitations due to colloid drop size and number density, effect of electron and ion emission from drops, breakdown strength. GRA

N75-26019# Battelle Columbus Labs., Ohio.
EXPERIMENTAL INVESTIGATION OF HEAT RELEASE IN A PARTICLE SEEDED VORTEX Final Report, 1 Nov. 1972 - 30 Aug. 1974
Richard A. Robinson Nov. 1974 53 p refs
(Contract F33615-73-C-4027; AF Proj. 7116)
(AD-A004779; ARL-74-0134) Avail: NTIS CSCL 21/6

The thermo-hydraulic and fluid flow characteristics of a confined two-phase, two-component vortex were investigated both experimentally and analytically. The solid components of the two-phase mixtures that were studied were stainless steel microspheres and naturally enriched uranium dioxide spheroidized particles. The fluid component of the gas-solid vortex was either air or helium gas. An experimental apparatus was designed, fabricated, and operated to provide data on the effects of heat release from suspended particles on the fluid dynamics of a two-phase vortex chamber that simulated a colloid-core nuclear reactor. The apparatus was initially operated in the laboratory to provide baseline nonheated data and subsequently was located in a test cell of the Battelle Research Reactor to provide fission heating in the uranium dioxide particles. GRA

N75-26020# United Technology Center, Sunnyvale, Calif.
BALLISTIC MISSILE PROPELLANT EVALUATION TEST MOTOR SYSTEM (SUPER BATES) Final Report, 1 Apr. - 30 Sep. 1974
W. A. Stephen, T. C. Warren, and J. M. Humphrey 25 Nov. 1974 213 p refs
(Contract F04611-74-C-0022; AF Proj. 3059)
(AD-A004218; AFRPL-TR-74-70) Avail: NTIS CSCL 21/8

A two phase program was conducted to define requirements and to prepare a preliminary design of a test motor system that will accurately and economically simulate the chamber environments of present and future large solid propellant rocket motors. A segmented motor configuration with 28-in. outside diameter case bonded propellant grains was selected. The nominal grain configuration is an internal burning cylinder with both ends burning. GRA

N75-26021# TRW Systems, Redondo Beach, Calif.
CONTINUED DEVELOPMENT OF HIGH PERFORMANCE COLLOID SYSTEMS Final Report, Feb. 1973 - Jul. 1974
P. W. Kidd Oct. 1974 57 p refs
(Contract F04611-74-C-0014; AF Proj. 3058)
(AD-A004217; AFRPL-TR-74-57) Avail: NTIS CSCL 21/3

A five-month program was conducted to compare the thrust stand performance characteristics of the annular slit and tubular high thrust density colloid emitters. A three-emitter module was constructed by both Electro-Optical Systems (annular) and TRW Systems Group (tubular) and acceptance tested by time-of-flight (TOF) measurement techniques. Each module was then evaluated under identical conditions by TRW using direct thrust measurement techniques. A11 program objectives were met with the exception of 100 continuous hours on the EOS module. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-26022 British Library Lending Div., Boston Spa (England).
METHODS OF CARBON FORMATION DURING METHANE PYROLYSIS IN THE TEMPERATURE RANGE 800-1100 C
A. A. Anisonyan 11 Oct. 1974 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Arm. SSR (USSR), v. 51, no. 2, 1970 p 101-105
(BLL-CE-Trans-6034-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The study of carbon formation during the process of methane pyrolysis in an empty reaction vessel and in reaction vessel with various packings is reported. The experiments were carried

out on a flow apparatus in a quartz reaction vessel. The internal walls of the reactor and the packing were previously coated with carbon by means of methane decomposition at 1000 C. Methane from the Melitopolsk deposit, which contains virtually no other hydrocarbons, after removal of O2 and drying over molecular sieves, was passed through a rheometer and underwent pyrolysis. The products thus obtained passed through a trap, immersed in solid carbon dioxide, and were collected in a gas container. The quantities of carbon and liquid hydrocarbons formed were determined gravimetrically. Analysis of the reagent gas was carried out by the chromatographic method. The gaseous hydrocarbons, apart from methane, were determined with the DIP-1 instrument and the CH4, H2 and N2 on the KhL-3. For purposes of drawing up the carbon balance, the liquid hydrocarbons were regarded as benzene. Author

N75-26023# Technische Universitaet, Munich (West Germany).
ON THE INFLUENCE OF ORGANIC SOLVENTS ON THE ACTIVITY AND STABILITY OF PROTEASES Ph.D. Thesis [ZUM EINFLUSS ORGANISCHER LOESUNGSMITTEL AUF DIE AKTIVITAET UND STABILITAET VON PROTEASEN]
Fritz Thurner 4 Jul. 1974 128 p refs In GERMAN
Avail: NTIS HC $5.75

Various organic, water soluble cosolvent reactions with proteases showed that increased basicity changed activation into inhibition. Optical polarization measurements established in general an expansion of protein molecules of up to 10 percent at minor solvent concentrations. A larger cosolvent component reversed molecular expansion and increased activity. Velocity-solvent-concentration diagrams detailed at pH 9.6 optimum a noncomqetitive affect for activating solvents; acetonitrile produced mixed inhibition. Ethanole, propylene glycol-1,2, propylene glycol-1,3 and ethylene glycol positively stabilized trypsine. Quantitative electrolysis on an incubated trypsine solution proved that glycol stabilization depended on decreased autolytic velocity. Transl. by G.G.

N75-26024# Stanford Research Inst., Menlo Park, Calif. Physical Sciences Div.
THE ABSOLUTE MEASUREMENT OF RATE CONSTANTS FOR SOME KEY REACTIONS INVOLVING FREE RADICALS Final Report, 1 Jun. 1971 - 31 Dec. 1974
Peter C. Beadle, Sidney W. Benson, Kwang Yul Choo, David M. Golden, and Michael J. Perona Dec. 1974 91 p refs
(Contract F44620-71-C-0103; SRI Proj. PYU-1299; AF Proj. 9750)
(AD-A003712; AFOSR-75-0046TR) Avail: NTIS CSCL 07/3

The rate constant for t-butyl radical combination was determined over the temperature range 620-690K, using the very low-pressure pyrolysis (VLPP) technique. The value of the combination rate constant, and the disproportionation combination ratio, were independent of temperature. The rate constant for ethyl radical combination was determined at 843 and 878K. The high pressure absolute rate constants for the decomposition of nitrosobenzene and pentafluoro-nitrosobenzene were determined using the (VLPP) technique. The thermal decomposition of t-butylmethyl ether has been studied. GRA

N75-26025# Arizona Univ., Tucson. Dept. of Chemistry.
IN-PLACE CONVERSION OF STRAINED BICYCLIC COMPOUNDS TO STABLE POLYMERS Final Report, 1 Apr. 1972 - 30 Jun. 1974
Henry K. Hall, Jr., Gerry K. Noren, Pierre A. Ykman, and Jean Otton Oct. 1974 13 p refs
(Grants DA-ARO(D)-31-124-72-G101; DA-ARO(D)-31-124-73-G49)
(AD-A004673; AROD-9480-6-C) Avail: NTIS CSCL 07/3

A simple synthesis of new electronegatively substituted bicyclobutane monomers has been worked out. It involves a 2-2 cycloaddition of tri(electronegatively substituted) ethylenes with dimethylaminoethylenes, followed by conversion to the quaternary ammonium salt and cross-ring elimination effected by base. A new copolymer synthesis involving the copolymerization of tri(electronegatively substituted) ethylenes with electron-rich vinyl monomers has been established under free radical polymerization conditions. A second new copolymer synthesis, involving the copolymerization of tri(electronegatively substituted) ethylenes with mono(electronegatively substituted) bicyclobutane monomers has been devised. The synthesis of an intermediate for a new type of monomer, the 2-oxabicyclobutanes, has been accomplished. It involves chlorination of 2-cyano-oxacyclobutanes, followed by dehydrohalogenation to give the bicyclic compound. GRA

N75-26026 Materials Research Labs., Maribyrnong (Australia).
ORGANIC SULPHUR COMPOUNDS OF NATURAL DERIVATION: A BIBLIOGRAPHY
M. W. Jarvis and K. J. Ward May 1975 610 p refs
(MRL-R0613) Avail: Issuing Activity

A bibliography is presented of sulfur compounds of natural derivation; the listing of compounds gives molecular formula structure, sources of and key literature, and references to each of their compounds. The compounds listed include acetylenes, theophenes, cumulenes, polyenes, sulfuric acid derivatives, sulphide, amonio acids, alkaloids, peptides, thiocyanites, antibiotics, thiols, and methylthioacrylates. M.J.S.

24 COMPOSITE MATERIALS

Includes laminates.

N75-26027 Virginia Polytechnic Inst. and State Univ., Blacksburg.
VISCOELASTIC CHARACTERIZATION OF ANGLE PLY ADVANCED COMPOSITES Ph.D. Thesis
Ashok B. Thakker 1974 192 p
Avail: Univ. Microfilms Order No. 75-11951

Time dependent properties of angle ply laminated boron/epoxy and graphite/epoxy fiber controlled composites were investigated to develop a technique to establish interconversion of test results using appropriate viscoelastic theory to formulate an accelerated testing procedure. Forced vibration, constant strain rate, and creep tests were performed at different temperature levels. Behavior below the glass transition temperature was studied. Multiple regression techniques were used to generate response surfaces for significant variables. Master curves using the time-temperature superposition principle were established for individual tests. Mechanical model representation, integral equation formulation, and numerical integration methods based on linear viscoelasticity were used to predict constant strain rate and long time creep behavior of composites from nondestructive short time dynamic tests. It is shown that a regression equation and its constants can be used to obtain horizontal and vertical shift and also to perform viscoelastic analysis. Applicability of linear viscoelastic theory to predict the gross behavior of these composites is established. Dissert. Abstr.

N75-26028 Polish Academy of Sciences, Warsaw.
POLYMORPHOUS PHASE TRANSFORMATIONS OCCURRING UNDER HIGH PRESSURES, AND THEIR GEOPHYSICAL ASPECTS [FAZOWE TRANSFORMACJE POLIMORFICZNE ZACHODZACE POD WYSOKIMI CISNIENIAMI I ICH ASPEKT GEOFIZYCZNY]
Jacek Leliwa Kopystynski 26 Feb. 1975 95 p refs In POLISH
Avail: Issuing Activity

Results are presented of investigations of polymorphous phase transformations and their connection with the focus of an earthquake. Topics discussed include: equations for the hysteresis loop, construction and investigation of phenomenological models of polymorphous phase transformations, interpretation of experimental results, analytical algorithms, and aspects of geophysical transformation. Mathematical models are presented, and the results of using these are compared with experimental results. Transl. by M.J.S.

N75-26029 Polish Academy of Sciences, Warsaw.
A TEST OF THE APPLICATION OF ULTRASONIC METHODS FOR INVESTIGATING THE DEGREE OF HARDENING OF PHENOLOGICAL MATERIALS [PROBA ZASTOSOWANIA METOD ULTRADZWIEKOWYCH DO BADANIA STOPNIA UTWARDZENIA TWORZYW FENOLOWYCH]
Krzysztof Kunert 30 Jan. 1975 17 p refs In POLISH
Avail: Issuing Activity

The possibility of using ultrasonic methods is discussed along

with an analysis of the feasibility of using these methods under production conditions. It was found that the degree of hardening can be determined by measuring the wave propagation velocity, but that the use of these methods is not feasible under production conditions. Transl. by M.J.S.

N75-26030*# Kanner (Leo) Associates, Redwood City, Calif.
PROCESS FOR THE MANUFACTURE OF PARTS WITH A OXYNITRIDE BASE
J. P. Mary, P. Lortholary, P. Goursat, and M. Billy Washington NASA Jul. 1975 15 p Transl. into ENGLISH from French Patent Application no. 2.221.421 (15 Mar. 1973) 13 p
(Contract NASw-2481)
(NASA-TT-F-16440) Avail: NTIS HC $3.25 CSCL 11D

Refractory parts are manufactured from a silicon oxynitride-base powder with a refractory metal oxide additive. The powder is shaped, and the part formed is then coated with the same powder to prevent its deformation during heat treatment. After heat treatment, this coating is in the form of a loose shell which easily breaks away upon impact. Author

N75-26031# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
INTERNATIONAL CONFERENCE ON SiC - 1973: CLOSING REMARKS
Charles E. Ryan 21 Nov. 1974 5 p refs Presented at the 3d Intern. Conf. on Silicon Carbide, Miami Beach, Fla., 17-20 Sep. 1973
(AF Proj. 5620)
(AD-A003495; AFCRL-TR-74-0578) Avail: NTIS CSCL 20/12

The Third International Conference on Silicon Carbide (1973) is put into perspective with the two previous conferences in 1959 and 1968. The future directions of related research are suggested: First, the exploitation of silicon carbide as a semiconductor and, second, the extension of related technology to other refractory materials. GRA

N75-26032# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
FINITE ELEMENT ANALYSIS SYSTEM FOR THE MECHANICAL BEHAVIOR OF ORIENTED FIBER COMPOSITE MATERIALS UNDER COMBINED STRESSES Interim Report, 1 Jun. 1973 - 31 May 1974
Lynn J. Ebert, Timothy J. Griesbach, and Paul L. Flynn Jun. 1974 144 p refs
(Grant AF-AFOSR-2374-72; AF Proj. 6813; AF Proj. 9782)
(AD-A003746; AFOSR-75-0042TR) Avail: NTIS CSCL 11/4

A study was conducted to examine the mechanical behavior of unidirectional fiber composites under multiaxial loading conditions. Of particular concern was the occurrence of plastic flow in both the fibers and matrix of composite systems possessing ductile fibers. An analytical model has been developed which incorporated plastic flow effects in the composite under any multiaxial loading without shear. This model used a micromechanics approach in calculating the internal stress distributions produced by an externally applied load using the finite element method of analysis. GRA

N75-26033# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
COMPOSITE FABRICATION WITH GRAPHITE-REINFORCED POLYSULFONE PREPREG TAPE Technical Report, Jan. - Mar. 1974
Dale K. Voss Nov. 1974 35 p
(AF Proj. 7340)
(AD-A004135; AFML-TR-74-217) Avail: NTIS CSCL 11/4

Graphite-reinforced polysulfone composites were fabricated from three inch wide Hercules 3004-AS prepreg tape. Mechanical properties of these composites were evaluated at R. T., 250F, and 300F. Humid aging tests performed at 120F and 95% R.H. show polysulfone/AS composite properties equal to, or superior than, epoxy/AS composites at test temperatures up to 250F. Processing studies indicated that quality laminates can be prepared at pressures as low as 100-200 psi. Finally, unnotched charpy testing revealed that polysulfone/AS composites possess higher damage threshold levels due to a better fiber-to-matrix bond than do epoxy/AS composites. This strength makes polysulfone composites very desirable in aircraft component applications where the risk of foreign object damage is high. GRA

N75-26034# United Aircraft Corp., East Hartford, Conn.
DEVELOPMENT OF HIGH STRENGTH, HIGH MODULUS NONMETALLIC RIBBON REINFORCED POLYMERIC COMPOSITES Final Report, 1 May 1973 - 30 Apr. 1974
Richard D. Veltri, Romeo G. Bourdeau, and Francis S. Galasso Aug. 1974 80 p refs
(Contract F33615-73-C-5116; AF Proj. 7340)
(AD-A003671; AFML-TR-74-137) Avail: NTIS CSCL 11/2

The development of high-strength, high modulus carbon and carbon-boron alloy ribbon from Kapton H film for incorporation into polymer composites was the objective of this program. The ribbon itself should have high specific mechanical properties at least comparable with present high performance fibers. The mechanical properties of the composites made from these ribbons should have certain mechanical properties superior to those presently attainable with fiber reinforced composites. Since this program involved the simultaneous development of two types of ribbon, this report is divided between carbon ribbon and carbon-boron alloy ribbon. The carbon ribbon part of the program involved both the development of a carbon ribbon to be processed into a high strength, high modulus carbon ribbon and also as a substrate for the carbon-boron alloy chemical vapor deposition. In the carbon-boron alloy ribbon part of the program, processing from the precursor substrate to final reinforcing ribbon by means of the chemical vapor deposition is reported. Ribbon evaluation and composite fabrication will be discussed under each of the above divided programs. GRA

N75-26035# Manchester Univ. (England). Dept. of Textile Technology.
RESEARCH ON A BASIC STUDY OF THE HIGH-SPEED PENETRATION DYNAMICS OF TEXTILE MATERIALS Final Technical Report, May 1973 - Apr. 1974
J. W. S. Hearle and M. A. I. Sultan May 1974 61 p refs
(Contract DAJA37-73-C-3723)
(AD-A003504) Avail: NTIS CSCL 11/5

The report presents the experimental results and related discussions of a study on the factors controlling ballistic penetration of textile materials. In addition to a description of the experimental apparatus, the report presents data on ballistic and Instron penetration tests for a variety of polymeric films, natural and polymeric fibers in bonded, spun-bonded, woven, needled, and knitted textile fabrics. SEM studies on impacted fabrics are included. Results indicate energy absorption capability depends on the ability of the fabric structure to propagate large strains as well as its rupture or penetration strength. The former is dependent on the degree of locking within the fabric for a given material; the latter was dependent on the tensile strength and modulus of the fabric with the greater energy absorption capability residing with the low modulus, flexible materials. GRA

N75-26036# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
FRACTURE ANALYSIS OF FATIGUE DAMAGE MECHANISMS IN FIBER REINFORCED COMPOSITE MATERIALS USING SCANNING ELECTRON MICROSCOPY Interim Report
R. S. Williams and K. L. Reifsnider 1974 39 p refs
(Grant AF-AFOSR-2358-72; AF Proj. 6813; AF Proj. 9782)
(AD-A003742; AFOSR-75-0041TR) Avail: NTIS CSCL 11/4

Experimental and analytical methods were used to characterize the fatigue damage processes in fiber reinforced composite materials. Composite scanning electron microscope fractographs (approximately 70-80x) of two composite material systems (boron/epoxy and boron/aluminum), having the same fibers, layup, and geometry, but different matrix materials, are presented and discussed in detail. Both high and low frequency strain controlled fatigue tests and static test fractures were examined. Distinct differences between static and fatigue damage, and high and low frequency fatigue damage were observed. These damage modes are detailed and summarized in tables, and a physical model describing the fracture process in these materials is presented by means of a flow chart. This model considers the

cases of static or fatigue loading, high or low cycling frequency, and weak or strong interface behavior. GRA

N75-26037# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USING HIGH TEMPERATURE SOLAR INSTALLATION TO STUDY REFRACTORY MATERIALS IN AN OXIDIZING MEDIUM IN AN EXAMPLE OF BETA-ALUMINA
T. V. Efimovskaya and A. A. Lanin 20 Dec. 1974 12 p refs Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR, Ser. Tekhn. Nauk (Erevan), v. 26, no. 4, 1973 p 3-7
(AD-A004451; FTD-HT-23-655-75) Avail: NTIS CSCL 11/2

High-aluminous aluminates of alkali and alkali-earth metals, usually referred to as beta-alumina, are used as solid electrolytes in the preparation of separators of cells of electrochemical elements of energy converters. These studies of thermal decomposition of beta-alumina have shown high possibilities for using a high-temperature solar installation to study the behavior of refractory materials in an oxidizing medium over a wide range of temperature under the conditions which ensure a high purity in the heating and melting processes. GRA

N75-26038# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
EFFECT OF LOW LEVEL IMPACT ON ADVANCED HYBRID COMPOSITES Final Report, 1 Mar. 1974 - 1 Jan. 1975
J. L. Perry, D. F. Adams, and A. K. Miller 1 Jan. 1975 140 p refs
(Contract N00019-74-C-0229)
(AD-A0040; U-6124) Avail: NTIS CSCL 11/4

Advanced hybrid composites fabricated with graphite fibers and third phase reinforcement were evaluated as to their capability of improving impact resistance. The third phase reinforcements investigated were glass cloth, aluminum wire screen, titanium foil and glass yarn. Off-axis hybrid composites with a fiber orientation of 0, plus or minus 45, 90 degrees were tested in flexure, tensile, shear and unnotched instrumented impact. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N75-26039 British Library Lending Div., Boston Spa (England).
INVESTIGATIONS INTO THE MASS TRANSFER OF SULPHURIC ACID FROM VAPOUR PHASE OF COMBUSTION PRODUCTS ONTO A WALL AT A TEMPERATURE BELOW THAT OF CONDENSATION
A. K. Vnukov et al 14 May 1974 16 p refs Transl. into ENGLISH from Termoaerodinamika (Minsk), 1970 p 3-16
(BLL-CE-Trans-6364-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

It was found that when fuel containing organic sulfur is fired, 1-2% of this sulfur oxidizes to sulfuric anhydride SO3 which causes destructive sulfuric acid corrosion of the air preheaters, economizers, gas flues, smoke stacks, and surfaces operating at a temperature of 120-140 C and coming into contact with the gases. In the majority of cases the rates of interaction between the metal and the corrosion agent are greater than the mass transfer rate of this agent. The laws of mass transfer were investigated to produce instruments for measuring the dew point and to assess correctly the readings of these instruments. Condensation as a method for deep cleaning SO3 from gas flues is considered. Author

N75-26040 British Library Lending Div., Boston Spa (England).
THE PROPERTIES OF SULPHUR HEXAFLUORIDE IMPREGNATED POLYETHYLENE
T. Kojima, M. Hanai, K. Yagi, and K. Okusa 11 Nov. 1974 32 p refs Transl. into ENGLISH from Showa Wire and Cable Review (Tokyo), v. 22, no. 1, 1972 p 11-21
(BLL-CE-Trans-6545-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

The improvement of the insulating qualities of polyethylene was studied theoretically and experimentally. It is shown that SF6 dissolves in the amorphous phase of polyethylene inclusive of microvoids. The diffusion coefficient and permeability factor are low but the solubility coefficient is high. Conditions for the impregnation of SF6 into an electrical cable are within a practical range, and it is shown that the voltage for tree formation in polyethylene impregnated with SF6 greatly improves with increase in SF6 content. Author

N75-26041 British Library Lending Div., Boston Spa (England).
STUDY AND DEVELOPMENT OF OIL ADDITIVES
R. A. Petrosyan, K. E. Zeger, K. I. Ivanov, and E. Chmouzh 9 Jul. 1974 13 p Transl. into ENGLISH from Energiya (Moscow), 1971 p 143-147
(BLL-CE-Trans-6458-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Laboratory investigations of various oil additives were conducted, resulting in the recommendation of certain mineral water-soluble additive which improve the properties of boiler deposits. The additives VTI-4ST (an aqueous solution of magnesium chloride) was selected for industrial trials; the results of the investigation of this additive are reported. Author

N75-26042 British Library Lending Div., Boston Spa (England).
VAPOURIZATION OF LANTHANUM CHROMITE IN VACUO AT HIGH TEMPERATURES
T. Sasamoyo and Toshiyuki Sata 10 Jun. 1974 23 p refs Transl. into ENGLISH from Yogyo Kyokai Shi (Japan), v. 79, no. 11, 1971 p 408-418
(BLL-CE-Trans-6381-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The vaporization of LaCrO3 at high temperature in a vacuum (1650-1900 C) was investigated by the Langmuir free evaporation method and target capture using a Knudsen cell. It was found that the vapor pressure of the chromium component in equilibrium with LaCrO3, as determined by target capture method, was about 1/5 of that of pure chromium. The ratio of vapor pressures of the chromium component and lanthanum oxide component, P(Cr2O3)/P(La2O3), was 0.045-0.051. The vapor pressure of the chromium component (determined by the Langmuir method) was about 1/100 of that measured by the target capture method, giving a vaporization coefficient of 0.01. The X-ray diffraction pattern of the surface after vaporization did not agree with the expected pattern of a mixture of LaCrO3 and La2O3. At 1900 C, a pattern ascribed to a C-type rare earth oxide structure (cubic system) was obtained. Measurement of the concentration distribution of Cr using EPMA indicated that the rate of vaporization in sintered LaCrO3 was controlled by an interfacial reaction. Vaporization was found to proceed by the formation on the surface of a layer of La2O3 containing 2-3 mol. % of Cr2O3 and decomposition of this layer in contact with unreacted LaCrO3. Author

N75-26043* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VAPOR PHASE GROWTH OF GROUPS 3-5 COMPOUNDS BY HYDROGEN CHLORIDE TRANSPORT OF THE ELEMENTS Patent
Ramesh C. Tyagi (NAS-NRC), William J. Debnam, Jr., Maxwell F. McNear, Roger K. Crouch, and Roger A. Breckenridge, inventors (to NASA) Issued 10 Jun. 1975 6 p Filed 19 Dec. 1973 Supersedes N74-27261 (12-16, p 1958)
(NASA-Case-LAR-11144-1; US-Patent-3,888,705; US-Patent-Appl-SN-426405; US-Patent-Class-148-175; US-Patent-Class-117-106A; US-Patent-Class-117-107.2; US-Patent-Class-117-201; US-Patent-Class-118-48; US-Patent-Class-118-49.1; US-Patent-Class-252-62.3GA) Avail: US Patent Office CSCL 07D

A method of forming binary, ternary, and quaternary compounds derived from elements of groups III and V by a hydrogen chloride-hydrogen carrier gas is reported. The gas is separately contacted with the desired elements at elevated temperatures to provide the corresponding subchlorides, which are then transported to a reaction zone for final deposition of the respective elements on a single crystal substrate derived

from one or more elements of groups III or V. The rate of flow of the carrier gas over each element is adjusted such that the elements are deposited on the substrate in sufficient amounts to provide the desired binary, ternary, or quaternary compound.
Official Gazette of the U.S. Patent Office

N75-26044 Johns Hopkins Univ., Baltimore, Md.
INVESTIGATION OF THE MECHANISM OF PROPYLENE OXIDATION OVER ZINC OXIDE Ph.D. Thesis
Blanca Louise Kugler 1974 89 p
Avail: NTIS Avail: Univ. Microfilms Order No. 75-12986

An investigation of the mechanism of propylene oxidation by oxygen on a zine oxide surface was carried out using adsorption techniques as well as infrared, ESR, and mass spectrometry. A reaction between propylene and oxygen was found to occur, and acrolein was identified as the major product. Glycidol and glycidaldehyde were found to be probable intermediates. A mechanism for the reaction is proposed, and comparisons are made between this mechanism and proposed mechanisms over more effective catalysts such as cuprous oxide and bismuth molybdate. Dissert. Abstr.

N75-26045 Arizona Univ., Tucson.
STRUCTURAL PROPERTIES OF SOME COPPER(1) CARBOXYLATES Ph.D. Thesis
Richard Duane Mounts 1974 183 p
Avail: Univ. Microfilms Order No. 75-11922

A structural study of copper(I) carboxylates was undertaken. Synthetic methods for the preparation of the copper(I) salts of chloroacetic, benzoic, acetic, phenylacetic, and trimethylacetic acids were developed. A single crystal of copper(I) acetate was prepared and used to determine the molecular structure with bond distances and angles of the compound. The structure consists of dimeric carboxylate-bridged Cu2(CH3-COO)2 groups linked together with bridges formed from carboxylate oxygens. The molecular structure is strictly planar with each of the copper atoms coordinated to four atoms. The electronic absorption spectrum of each of the copper(I) salts in acetonitrile solution showed that the compounds contained d10-copper ions; there was no evidence of a d-d electronic transition. The absence of an absorption band at 375 nm and its presence in the spectra of the copper(II) salts supports the previous assignment of this band to a charge transfer orgin. Dissert. Abstr.

N75-26046 Pennsylvania State Univ., University Park.
HIGH PRESSURE COMBUSTION OF LIQUID FUELS Ph.D. Thesis
Grady Stanley Canada 1974 161 p
Avail: Univ. Microfilms Order No. 75-10789

Measurements were made of the burning rates and liquid surface temperatures for a number of alcohol and n-paraffin fuels under natural and forced convection conditions. The natural connection cold gas tests considered the combustion in air of methanol, ethanol, propanol-1, n-pentane, n-heptane, and n-decane droplets. Near critical combustion was observed for methanol and ethanol. Vaporization rates and liquid surface temperature measurements were made of droplets burning in a simulated combustion chamber environment. The phase equilibrium models of the analysis included both low and high pressure versions, with the latter allowing for real gas effects and the solubility of the combustion gases in the liquid phase. The low pressure theory predicts a significantly lower pressure for critical combustion, at a given ambient oxygen concentration, than the high pressure theory and higher liquid surface temperatures at all pressures for critical combustion. Dissert. Abstr.

N75-26047 Pennsylvania State Univ., University Park.
COMBUSTION OF A SUBMERGED TURBULENT OXIDIZER JET IN A LIQUID METAL Ph.D. Thesis
James Frederick Avery 1974 135 p
Avail: Univ. Microfilms Order No. 75-10808

The combustion of a gaseous oxidizer jet discharging through an injector submerged in a bath containing a molten fuel was investigated. Conditions were limited to high injector Reynolds numbers, which generate a turbulent two-phase forced jet as opposed to a stream of individual bubbles. Chlorine was used as the oxidizer with sodium as the fuel. The extent of the gaseous portion of the flow was observed with X-rays. Temperature measurements were made along the centerline of the jet, in the region downstream of the active combustion zone. The two-phase turbulent combustion process was analyzed in a manner similar to conventional diffusion flames. A variable density single-fluid model was used to represent the two-phase mixture.
Dissert. Abstr.

N75-26048 Stanford Univ., Calif.
PHOTOELECTRONIC PROPERTIES OF HIGH-RESISTIVITY GaAs:O AND GaAs:Cr SINGLE CRYSTALS Ph.D. Thesis
Alice Wei-Lung Lee Lin 1975 206 p
Avail: Univ. Microfilms Order No. 75-13551

The photoelectronic properties of high-resistivity n-type GaAs:O and GaAs:Cr single crystals were investigated through measurements of dark conductivity and Hall effect, optical absorption, photoluminescence, photoconductivity, and photo-Hall effect as a function of photon energy, light intensity and temperature, optical quenching of photoconductivity, and thermally stimulated conductivity. The results of all measurements are described by a four-level model plus eight electron trapping states for GaAs:O; and a five-level model plus seven electron trapping states for GaAs:Cr. Low-frequency photocurrent oscillations in GaAs:O are associated with the 1.25 eV level, and in GaAs:Cr, oscillations are associated with both the 1.25 and the 0.86 eV level. Measurements show that the capture cross section of five of the electron trapping states is small, but increases with electric field. Possible origins for the imperfection levels are proposed. Effects of heat treatment and plastic deformation on high-resistivity GaAs:Cr were investigated. Changes in electron mobility, concentration, and lifetime after heating and deformation are described in terms of interactions of dislocations and point defects, and by the effects due to sample inhomogeneity. Dissert. Abstr.

N75-26049 Kent State Univ., Ohio.
THE EFFECT OF COMPRESSIBILITY ON THE THERMODYNAMIC PROPERTIES OF LIQUID CRYSTALS Ph.D. Thesis
John Chow Hing Chin 1974 168 p
Avail: Univ. Microfilms Order No. 75-11986

The first order elastic energy term for condensed phases is introduced into the constant volume version of the Maier-Saupe theory of the nematic phase, and in the McMillan theory of the smectic-A phase of liquid crystals. A constant pressure ensemble is used to elucidate the various constant pressure thermodynamic quantities. For systems exhibiting first order transitions at constant pressure the relative volume change across the mesophase transition is calculated. The role of the compressibility of the system in changing over a second order phase transition at constant volume to one of first order at constant pressure is evaluated. A graphical solution together with an equal area (Maxwell) construction is utilized to solve the self-consistent equations obtained. The constant pressure temperature is calculated if the constant volume transition is known. The graphical solution is also used to find the relative volume change across the mesophase transformation, if one exists. Dissert. Abstr.

N75-26050 Yale Univ., New Haven, Conn.
A THEORY OF PRETRANSITIONAL EFFECTS IN THE ISOTROPIC PHASE OF LIQUID CRYSTALS Ph.D. Thesis
John Thomas Bendler 1974 107 p
Avail: Univ. Microfilms Order No. 75-11276

A phenomenological theory of pretransitional effects in the isotropic phase of nematic liquid crystals is developed. A local free energy density is defined and contributions arising from deviations in orientational order and number density are examined. Corrections to thermodynamic properties stemming from the growth of the fluctuations as the phase transition is approached are computed. Anomalies in the heat capacity, compressibility, and expansion coefficient are calculated. Magnetic birefringence and the intensity of scattered light arising from the fluctuations are also calculated. A diffusion model is adopted to treat the dynamics of the fluctuations. A theory of sound absorption and dispersion is developed in terms of dynamic heat capacity. Experimental results for p-azoxyanisole and p-methoxybenzylidene p-n-butylaniline agree well with mean-field model predictions. It is shown that the theory of fluctuation dynamics presented is consistent with line-width measurements of scattered light and with magnetic resonance measurements of the spin-lattice relaxation times. Dissert. Abstr.

N75-26051 Wayne State Univ., Detroit, Mich.
THEORY AND APPLICATION OF STAIRCASE VOLTAMMETRY: MIXED DIFFUSION AND RATE CONTROLLED ELECTRON TRANSFER WITH COUPLED CHEMICAL REACTION Ph.D. Thesis
Kim Wing-Lau Lam 1974 330 p
Avail: Univ. Microfilms Order No. 75-13351

The theory of staircase voltammetry for electrode reactions with quasi-reversible electron transfer coupled with a first order or pseudo-first order preceeding or following chemical reaction was developed. The relationships between kinetic parameters and experimental variables were derived. Two mathematical approaches were employed in the derivations. The boundary value problems were solved by Laplace transformation techniques and digital simulation methods. In derivations using the Laplace transformation techniques, the product of the sum of the homogeneous rate constants with the step time was assumed much greater than unity; while using the digital simulation method, practical considerations of computational time limited the value of the same product to be less than ten. The results obtained from derivations using either approaches are in the form of numerical values calculated from a high speed computer.
Dissert. Abstr.

N75-26052 Northern Illinois Univ., Dekalb.
THE APPLICATION OF PATTERN RECOGNITION TO CHEMICAL ANALYSIS: THE CORRELATION COEFFICIENT TECHNIQUE Ph.D. Thesis
Nels Homer Mahle 1974 150 p
Avail: Univ. Microfilms Order No. 75-13144

The structural determination of organic compounds using an empirical pattern recognition technique was evaluated. An empirical pattern recognition technique called the correlation coefficient technique was developed. Both the general and specific computer system details are discussed and effects of different preprocessing and feedback methods are studied. Two main types of data sets are used. The first is low resolution mass spectra and the second is a collection of physical parameters. These parameters include: melting and boiling point data, density, refractive index, and solubility information for water, ethyl alcohol, and diethyl ether. Numerous examples of elemental and functional group analysis are shown. Results of the correlation coefficient pattern recognition technique are compared with other artificial intelligence methods. Dissert. Abstr.

N75-26053 Vanderbilt Univ., Nashville, Tenn.
SURFACE CHEMISTRY AND TRACE ANALYSIS TECHNIQUES FOR ENVIRONMENTAL PROBLEMS Ph.D. Thesis
Bruce Bauer Ferguson 1974 174 p
Avail: Univ. Microfilms Order No. 75-12768

Two environmental problems are considered: (1) removal of heavy metals from waste water and (2) the detection of nicotine in human milk. Foam separation techniques were evaluated to determine their feasibility for removing lead (II) and cadmium (II) from highly contaminated waste water. Ion flotation, precipitate flotation, and adsorbing colloid flotation were studied. It was found that increasing ionic strength and calcium (II) and phosphate interference significantly reduces the effectiveness of ion flotation. Precipitate flotation is more effective and relatively unaffected by these factors. Adsorbing colloid flotation gives excellent results and is not affected by interference factors. Through the method developed for detecting nicotine in human milk, it is possible to quantitate as little as 20 ppb nicotine. Nicotine was not found in milk from nonsmokers, but the concentration in samples from smokers averaged 98 ppb and ranged from 20 to 512 ppb.
Dissert. Abstr.

N75-26054 Miami Univ., Coral Gables, Fla.
ELECTRICAL CONDUCTIVITY AND THERMODYNAMIC PARAMETERS OF AMMONIUM PERCHLORATE Ph.D. Thesis
Michael Gregory Ohanian 1974 139 p
Avail: Univ. Microfilms Order No. 75-12862

The electrical conductivity of pure and doped single crystals of ammonium perchlorate (AP) was studied from 25 to 180 C. Activation energies for the conduction processes in the low and high temperature regions for pure AP are shown. The low temperature activation energy presumably represents the potential barrier for the migration of protons and the high temperature activation energy represents the barrier for the migration of (NH4)(+) ions. Electrical conduction and electrode reactions are postulated. Doped crystals containing various quantities of Mg (2+), Cu (2+), Ca (2+), Sr (2+), and SO4 (2-) are tested and activation energies for the cation doped crystals are compared to those of AP. A high activation energy for the SO4 (2-) doped crystals as compared to the cation doped crystals over the entire temperature range is shown. Impurity concentrations increase the conductivity over the entire temperature range, and the conductivity is also found to be a function of the radius of the cation impurity. A mechanism is proposed to explain this result.
Dissert. Abstr.

N75-26055 New Jersey Inst. of Technology, Newark.
THE INTERPRETATION OF INFRARED AND RAMAN SPECTRA USING PATTERN RECOGNITION Ph.D. Thesis
John Martin Comerford 1974 246 p
Avail: Univ. Microfilms Order No. 75-12792

An automatic classification of chemical compounds by computer processing of digitized spectral data is presented. The classification system is based on a branch of artificial intelligence known as supervised learning, and uses binary linear classifiers to identify compounds as alcohols, esters, ethers, ketones or compounds containing double bonds. Spectrum data were examined using pattern recognition techniques, and several methods of combining infrared and Raman data from the same compound were tested. The classification techniques were most successful when applied to concatenated infrared and Raman data. By taking the infrared data in the range from 500 to 1900 cu cm and concatenating them with Raman data from the same range, a vector representing each of the 400 compounds in the data set was obtained. Using an iterative pattern recognition technique a vector was calculated which would recognize compounds as members of a class or not. Several compounds for which observed frequencies have been assigned were tested to determine if the assignments could be supported by the trained vectors. Dissert. Abstr.

N75-26056 Stanford Univ., Calif.
EFFECT OF PLATINUM-OXYGEN INTERACTION ON THE CATALYTICITY OF PLATINUM FOR THE DECOMPOSITION OF NO2 Ph.D. Thesis
Tiong Gac Lee Ngo 1975 152 p
Avail: Univ. Microfilms Order No. 75-13565

The types of interaction discussed include chemisorption at both low and high coverages as well as the formation of bulk oxides. The kinetics of nitrogen dioxide decomposition on platinum wires was studied quantitatively using a cylindrical thermal conductivity cell. The heat conduction measurements show that platinum exhibits an abrupt increase in catalytic activity when heated above about 800 C. This conclusion is supported by scanning electron microscope observations which show extensive 'catalytic' etching of the platinum surface due to the decomposition of nitrogen dioxide. The rate of decomposition was found to be proportional to nitrogen dioxide concentration, and inversely proportional to the square root of oxygen concentration. Dissert. Abstr.

N75-26057*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPLORING THE CELL: SODIUM (BETA-ALUMINA) CUPRIC CHLORIDE - ALUMINUM CHLORIDE - SODIUM CHLORIDE BETWEEN 136 AND 200 C
Riley O. Miller Washington Jun. 1975 14 p refs
(NASA-TM-X-3245; E-8189) Avail: NTIS HC $3.25 CSCL 07D

Experiments were done with a molten-salt catholyte (initially CuCl2 in AlCl3-NaCl) separated from molten Na by beta alumina. The open-circuit reduction potentials were 4.3 and 3 volts for Cu++ and Cu+, respectively. High polarization and nonrechargeability characterized the cell's operation. The cell's ohmic resistance during discharge was higher than what would be expected from only the ionic resistance of the beta-alumina. Author

N75-26058*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A CATALYTIC REACTOR AT SIMU-

LATED GAS TURBINE COMBUSTOR OPERATING CONDITIONS
David N. Anderson, Robert R. Tacina, and Thaddeus S. Mroz Jun. 1975 41 p refs
(NASA-TM-X-71747; E-8381) Avail: NTIS HC $3.75 CSCL 21B

The performance of a catalytic reactor 12 cm in diameter and 17 cm long was evaluated at simulated gas turbine combustor operating conditions using premixed propane and air. Inlet temperatures of 600 and 800 K, pressures of 3 and 6 atm, and reference velocities of 9 to 30 m/s were tested. Data were taken for equivalence ratios as high as 0.43. The operating range was limited on the low-temperature side by very poor efficiency; the minimum exit temperature for good performance ranged from 1400 to 1600 K depending on inlet conditions. As exit temperatures were raised above this minimum, emissions of unburned hydrocarbons decreased, carbon monoxide emissions became generally less than 1 g CO/kg fuel, and nitrogen oxides were less than about 0.1 g NO2/kg fuel. Author

N75-26059*# California Univ., Berkeley. Dept. of Chemical Engineering.
THE SYNTHESIS OF HIGHER OXIDES OF ALKALI AND ALKALINE EARTH METALS IN AN ELECTRIC DISCHARGE: THEORETICAL AND EXPERIMENTAL STUDIES Final Report, 1 Jun. 1971 - 31 Aug. 1974
Alexis T. Bell and Pasupati Sadhukhan 31 Aug. 1974 135 p refs
(Grant NGR-05-003-462)
(NASA-CR-143024) Avail: NTIS HC $5.75 CSCL 07D

Potassium hydroxide was subjected to the products of an electrical discharge sustained in oxygen and produced both potassium peroxide and superoxide. The conversion to higher oxides was shown to strongly depend upon the particle size of KOH, the position of KOH in the discharge zone, and the operating conditions of the discharge. Similar experiments were performed with hydroxides of lithium and calcium which do not form superoxides, but are converted to peroxides. The yields of peroxides were shown to strongly depend upon the operating conditions of the discharge. The absence of superoxides and the presence of peroxides of lithium and calcium was explained from the consideration of relative thermodynamic stability of the oxides of lithium and calcium. Thermogravimetric analysis was shown to provide a more accurate means for determining the amount of KO2 than previous methods. Author

N75-26060*# Scientific Translation Service, Santa Barbara, Calif.
STERILIZATION WITH ETHYLENE OXIDE GAS
K. Liebermeister Washington NASA Jul. 1975 13 p refs Transl. into ENGLISH from Deut. Med. Wochenschr. (West Germany), v. 87, no. 11, 1962 p 552-555
(Contract NASw-2483)
(NASA-TT-F-16412) Avail: NTIS HC $3.25 CSCL 07D

A survey is presented of the uses of ethylene oxide gas and mixtures of it in sterilization; costs are compared with steam sterilization costs. Appropriate fields of use for gas, steam, and dry heat sterilization are discussed. Author

N75-26061*# Battelle Columbus Labs., Ohio.
SAMPLE DETECTION AND ANALYSIS TECHNIQUES FOR ELECTROPHORETIC SEPARATION Final Report
Richard D. Falb, Kenneth E. Hughes, and Thomas R. Powell 12 Jun. 1975 465 p refs
(Contract NAS8-29629)
(NASA-CR-143877) Avail: NTIS HC $11.50 CSCL 07D

Methods for detecting and analyzing biological agents suitable for space flight operations were studied primarily by literature searches which were conducted of cell separation techniques. Detection methods discussed include: photometrometric, electric, radiometric, micrometry, ultrasonic, microscopic, and photographic. A bibliography, and a directory of vendors are included along with an index of commercial hardware. F.O.S.

N75-26062*# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.
CATALYSTS FOR ELECTROCHEMICAL GENERATION OF OXYGEN Semiannual Status Report, 1 Oct. 1974 - 31 Mar. 1975
W. E. OGrady and J. Huang 31 Mar. 1975 16 p refs
(Grants NGR-36-027-050; NGR-36-027-052)
(NASA-CR-143061; SASR-6) Avail: NTIS HC $3.25 CSCL 07D

An effort was made to study the effects of cation and anion additions on oxygen evolution kinetics on platinum and the inhibitive or catalytic nature of the additions. The kinetics and mechanism of oxygen evolution on planitum metal in hydrofluoric and sulfuric acids, including the effects of foreign anions, were examined. The LEED-Auger-thin layer electrochemical system was developed for the examination of electrocatalytic surfaces. Samples for electrocatalytic LEED-Auger studies were prepared and examined. Author

N75-26063# Oklahoma Univ., Norman.
THERMODYNAMIC STUDIES OF THE EFFECTS OF SOLVENTS ON MOLECULAR COMPLEX FORMATION EQUILIBRIA; ORIENTATION OF WATER AROUND NONPOLAR IN SOLUTES AQUEOUS SOLUTIONS Ph.D. Thesis
Kwang Ok Yeo 1973 128 p refs
(Contract DI-14-31-0001-3836)
(PB-240157/8; OWRT-A-046-OKLA(1)) Avail: NTIS MF $5.75 CSCL 07D

The effect of solvents on electron-donor-acceptor complex formation reactions was studied thermodynamically. The nonpolar analog model (NPA) is examined theoretically, and methods are developed for using it to predict thermodynamic properties of the transfer of donor, acceptor, complex molecules from the gas phase into dilute solutions in nonpolar solvents. Thermodynamic results calculated by using the NPA model, in conjunction with solubility parameter theory and the Prigogine refined average-potential cell model theory, are compared with experimental results for polar components involved in several molecular complex formation equilibria. GRA

N75-26064# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Antriebssysteme.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS ON HEAT INPUT BURNING TRIETHYL ALUMINUM IN AIR-FLOWS
Michael Kallergis and Manfred Ahlswede 1975 47 p refs In GERMAN; ENGLISH summary
(DLR-FB-75-05) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. 21,10 DM

The possibility to improve ignition conditions and to obtain flame stabilization in combustion chambers with high velocities is examinated using a pyrophonic fuel (triethyl aluminum). The ignition delay when combustion is started and the Al2O3-deposits on a lifting propulsive body at low velocities are experimentally determined. A further study is given of heat input in the cylindrical combustion chamber burning aluminum trialkyls by considering the kind and the mass flow of the fuel. In a pressure velocity diagram are the lines of constant air-fuel-ratio plotted.
Author (ESRO)

N75-26065# Aerodyne Research, Inc., Burlington, Mass.
GROWTH OF CARBON PARTICLES Annual Report, 1 Aug. 1973 - 1 Aug. 1974
David M. Mann Oct. 1974 25 p refs
(Contract F44620-74-C-0005; AF Proj. 9711)
(AD-A003622; ARI-RR-57) Avail: NTIS CSCL 07/4

Soot formation is an undesirable facet of most hydrocarbon combustion processes. The present work has focused upon carbon particle formation in a controlled environment using in situ techniques to monitor carbon vapor molecular species and particle formation. A second motivation for studying carbon is the general scarcity of information about the nucleation process of high melting point materials. The specific approach taken in this work was to study particle formation in a cooling jet of carbon vapor diluted by an inert, carrier gas. Vapor was produced by the evaporation of a resistance heated graphite tube. The carbon vapor, mixed with carrier gas flowed into a light scattering chamber where spectroscopic measurements were performed on the cooling vapor. The report discusses the experimental apparatus, with particular emphasis on the carbon vapor furnace, observations of C2 and C3 molecular species and observations of carbon

particle formation, and indicated directions for continued studies. GRA

N75-26066# Rutgers Univ., New Brunswick, N.J. Dept. of Mechanics and Materials Science.
THE STRUCTURE AND PROPERTIES OF CRYSTALLINE POLYMERS AT HIGH PRESSURES Interim Report
B. A. Newman, K. D. Pae, and T. P. Sham Dec. 1974 14 p refs
(Contract N00014-67-A-0115-0007; NR Proj. 356-564)
(AD-A003927; TR-1) Avail: NTIS CSCL 20/2

A research program directed toward an understanding of the crystal structure, morphology, and properties of crystalline polymers under conditions of high pressure is being established. X-Ray techniques for the study of polymers at high hydrostatic pressures have been developed, and some initial data are presented. Crystallization of high-density polyethylene (Marlex 6009) at high pressures in a piston-cylinder apparatus has been carried out, and dynamic mechanical tests of some samples have been made. GRA

N75-26067# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE GROWTH OF SiC CRYSTALS FROM VAPOR BY THE BRIDGMAN-STOCKBARGER METHOD Physical Sciences Research Papers
Juris Smiltens 24 Sep. 1974 37 p refs
(AF Proj. 5620)
(AD-A003645; AFCRL-PSRP-603; AFCRL-TR-74-0470) Avail: NTIS CSCL 20/2

From the dissociation curve (P vs. T), an equation for the rate of raising the pressure P of the binary vapor for obtaining the required linear growth rate of the crystal of c centimeters per hour is derived. It is shown that the rate is nearly proportional to P. Modifications of the furnace since the last report (Mat. Res. Bull. 4, S85, 1969) are described. Justification for the use of helium as the inert ambient gas is given. Two techniques are used: (1) growing with constant temperature of the crucible point and (2) growing with constant pressure of the sublimation bottle. To date, only polycrystalline boules consisting of large grains have been obtained. It is believed, however, that with certain technological improvements the methods that are developed here will ultimately yield single crystal boules. As a by-product, small cubic crystals, about one mm in the largest dimension, with good quality faces (cube and octahedron) have been obtained. GRA

N75-26068# Army Tank-Automotive Command, Warren, Mich.
FIRE EXTINGUISHING PROPERTIES OF CHLORODIFLUOROMETHANE
Francis S. Lemmer and Sylvester T. Allen Jun. 1974 39 p refs
(AD-A003993; TACOM-TR-11926) Avail: NTIS CSCL 13/2

The fire extinguishing properties of chlorodifluoromethane were measured by using a propane gas burner fed with oxygen enriched air. The bench test employed controlled burner temperature, air and fuel pressure. Time to extinguish and quantity of chlorodifluoromethane used were the principal criteria for establishing extinguishing properties. Chlorodifluoromethane proved to be equal to another popular halogenated hydrocarbon, monobromotrifluoromethane. GRA

N75-26069# ARO, Inc., Arnold Air Force Station, Tenn.
SPECTRAL SIMULATION OF RESONANCE BAND TRANSMISSION PROFILES FOR SPECIES CONCENTRATION MEASUREMENTS: NO GAMMA-BANDS AS AN EXAMPLE Interim Report, FY 1973 - FY 1974
M. G. Davis, W. K. McGregor, and J. D. Few AEDC Jan. 1975 52 p refs Sponsored by AF
(ARO Proj. RF405; ARO Proj. RF425)
(AD-A004105; ARO-ETF-TR-74-73; AEDC-TR-74-124) Avail: NTIS CSCL 07/4

The equations necessary for the calculation of the integrated transmission of overlapped, Doppler-broadened spectral lines through a medium at a specified density, temperature, and path length are developed in conjunction with a computation procedure for simulation of a spectrometer output. The application is then made to resonance absorption by diatomic molecules. Existing band transmission data for the (0,0) band of the gamma-system of the nitric oxide molecule at low pressures are used to test the calculations. Satisfactory agreement between measured and calculated transmission spectral profiles was obtained. GRA

N75-26070# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
CONTINUUM ABSORPTION BY H2O BETWEEN 330 AND 825/CM Final Report, 16 Oct. 1973 - 30 Sep. 1974
Darrell E. Burch, David A. Gryvnak, and Francis J. Gates Sep. 1974 13 p refs
(Contract F19628-74-C-0069)
(AD-A003623; U-6095; AFCRL-TR-74-0377) Avail: NTIS CSCL 07/4

The continuum absorption by H2O in several narrow spectral intervals between 330 and 825/cm has been studied experimentally. Emphasis has been placed on intervals where most of the absorption results from lines centered more than 1/cm and pressures of pure H2O + N2 mixtures at room temperature. Results are compared with theoretical results and with those reported previously in the same spectral intervals for samples at higher temperatures. GRA

N75-26071# Southampton Univ. (England). Dept. of Chemistry.
STUDIES OF INFRARED CHEMILUMINESCENCE AND PHOTOELECTRON SPECTROSCOPY Interim Scientific Report, 1 Feb. 1972 - 31 Jan. 1974
Neville Johathan Jun. 1974 8 p
(Grant AF-AFOSR-2276-72; AF Proj. 8658)
(AD-A003685; AFCRL-TR-74-0388; ISR-3) Avail: NTIS CSCL 07/4

Progress regarding infrared chemiluminescence studies of simple atom-molecule reactions yielding hydrogen fluoride in vibrationally excited states is reviewed. Details of extension of the methods to include measurements of initial rotational energy level distributions are given. Particular reations considered are those of atomic fluorine with hydrogen, hydrogen chloride and methane. An account is also given of the progress towards studying these reactions under conditions where the reactant is energetically excited. The progress of vacuum ultra violet photoelectron spectroscopy studies of transient species is also given. GRA

N75-26072# Army Medical Research Lab., Edgewood Arsenal, Md.
THE COMPUTER SIMULATION AND OPTIMIZATION OF PASSIVE LOPAIR Progress Report, May 1973 - Oct. 1974
Dennis Flanigan and Howard Walter, Jr. Jan. 1975 40 p refs
(DA Proj. 1W7-63721-D-601)
(AD-A003844; ED-TR-74070) Avail: NTIS CSCL 07/4

The objectives of this effort were twofold: to derive suitable correlation functions for monitoring the atmosphere for specified nerve agents by a remote-sensing infrared alarm and to test the alarm by computer simulation. The correlation functions for four agents and a simulant are calculated by the simplex optimization method. This technique constrains the response of the alarm to less than some arbitrary constraint limit for the background changes while optimizing system response to the agent or simulant. The response to the simulant was 2 to 3 times greater than any background-induced change over a period of several weeks. The technique is applicable to a wide range of spectral analytical problems and may apply to process control as well as remote sensing techniques, particularly in pollution monitoring applications. GRA

N75-26073# Connecticut Univ., Storrs. Dept. of Physics.
THEORETICAL INVESTIGATIONS OF COLOR CENTERS IN ALKALI AZIDES Final Report, 15 Oct. 1970 - 14 May 1974
Ralph H. Bartram 29 Nov. 1974 18 p refs
(Grant DA-ARO(D)-31-124-71-G35)
(AD-A004025; ARO-9366-8-P; Rept-12) Avail: NTIS CSCL 07/4

Theoretical investigations of color centers in alkali azides included point-ion calculations for F and F2(+) centers in NaN3,

and an ab-initio molecular orbital calculation for N2(-) in NaN3. Calculated energy levels and spin-Hamiltonian parameters were compared with optical and ESR spectra. Supporting experiments correlated polarized optical and ESR spectra in NaN3, KN3, and RbN3 via isochronal annealing, and optical absorption bands were identified for both N2(-) and N4(-) defects. Non-local pseudopotential calcualtions for the F center in NaN3 are in progress. GRA

N75-26074# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.

A SYSTEM OF FORTRAN 4 COMPUTER PROGRAMS FOR CRYSTAL STRUCTURE COMPUTATIONS

Larry W. Finger and E. Prince Feb. 1975 136 p refs Prepared in cooperation with Carnegie Institution of Washington, D. C. (COM-75-10290/5; NBS-TN-854) Avail: NTIS; SOD HC as C13.46054, CSCL 20B

Descriptions and instructions are given for use of a system of programs for crystallographic calculations, including least-squares refinement with generalized systems of constraints, calculation of bond distances and angles with errors. Fourier synthesis, plotting of contours in Fourier maps, and preparation of structure factor tables for publication. GRA

N75-26075# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF AERODYNAMICS OF THE TURBULENT FLAME OF UNIFORM MIXTURE

L. A. Vulis, O. A. Kuznetsov, and L. P. Yarin 29 Nov. 1974 26 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" Moscow, 1972 p 330-336

(AD-A004394; FTD-MT-24-1918-74) Avail: NTIS CSCL 21/2

The formation of comparatively narrow zones in which reactions are localized and outside of which single transfer processes are realized is necessary for turbulent combustion of gas. Systematic measurements of the distribution of fundamental characteristics in straight and turned flames are discussed, and measurements were conducted in gas flames formed by the discharge of fuel (mixtures of propane-butane and air) into the air. M.J.S.

N75-26076# Georgetown Univ., Washington, D.C. Dept. of Chemistry.

STUDIES OF THE PROPERTIES OF SELECTED CHEMICAL COMPOUNDS FOR PREPARATION OF NEW MATERIALS Final Report, 1 Mar. 1970 - 30 Aug. 1974

Michael T. Pope Aug. 1974 9 p refs

(Grant AF-AFOSR-1833-70; AF Proj. 9540)

(AD-A003741; AFOSR-75-0024TR) Avail: NTIS CSCL 07/2

Synthesis and characterization of new heteropoly complexes containing Re(V), Re(VI), Re(VII), OsN(3+), RuNO(3+), RuNO(2+), U(V) and Ce(III) are reported. Rapid reversible electron transfer between isostructural pairs of heteropoly complexes has been studied. Optical and ESR spectroscopy of mixed valence polyanions (heteropoly blues) have shown that such compounds contain electrons that are delocalized over several metal atoms by a thermally activated hopping process. Heteropoly blues are therefore molecular analogs of semiconducting metal oxides. Hydrogen-bonded and charge transfer complexes involving heteropoly anions in aprotic solvents, and selective oxidation of catechols are described. GRA

N75-26077# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMODYNAMIC BASES OF THE SEPARATION OF AIR, DIAGRAMS AND APPARATUSES OF AIR SEPARATING PLANTS, CHAPTER 4

V. I. Epifanova and L. S. Akselrod 26 Nov. 1974 221 p Transl. into ENGLISH from the book "Razdelenie Vozdukha Metodom Glubokogo Okhlazhdeniya. Termodinamicheskie Osnovok Razdeleniya Vozdukha Skhemy i Apparaty Vozdukhorazdelitelnykh Ustanovok" USSR, v. 1, 1973 p 153-259

(AD-A004345; FTD-HC-23-1723-74) Avail: NTIS

The report discusses the design and operation of air separating plants, i.e. industrial plants for the fractionation and recovery of oxygen, nitrogen, and minor constituents of air. The basic processes and equipment used are described, and general trends in construction and problems of the technological construction are discussed. Efficiencies of the separation circuits are also considered. GRA

N75-26078# Brigham Young Univ., Provo, Utah. Dept. of Chemical Engineering.

RESEARCH ON NON-STEADY COMBUSTION AND EXTINGUISHMENT Interim Report

Ralph L. Coates and M. Duane Horton May 1974 53 p refs (Grant AF-AFOSR-1895-70; AF Proj. 9711)

(AD-A004415; AFOSR-75-0050TR) Avail: NTIS CSCL 21/2

Prior reports of work accomplished on this grant describe a mathematical model of nonsteady rocket motor ballistics based on a simplified combustion theory. Current work is directed toward exploring the limitations of the theory. This is being done by carrying out a series of six experiments with different propellants and comparing the experimental results with theoretical predictions. The six experiments are: (1) Pressure dependence of burning rate, (2) L*-instability, (3) acoustic instability, (4) ignition, (5) response of steady burning to initial temperature variation, and (6) response of steady burning to thermal radiation. A modification of existing T-Burner theory has been considered. GRA

N75-26079# Universitaets-Sternwarte Goettingen (West Germany). Inst. fuer Physikalische Chemie.

INFLUENCE OF VARIOUS PARAMETERS ON INITIATION, STABILITY, AND LIMITS OF DETONATIONS Interim Report, 1 Jun. 1973 - 31 May 1974

W. Jost and H. G. Wagner 15 Nov. 1974 31 p

(Grant AF-AFOSR-2541-73; AF Proj. 9711)

(AD-A004785; AFOSR-75-0183TR) Avail: NTIS CSCL 21/2

The propagation of spherical flames has been investigated under conditions where artificial turbulence was generated at a certain distance from the center. When reading that turbulent layer the flame propagation velocity increased by a certain factor--(about 3 for mixtures of C2H4-air). Reduction of the N2 contact in the mixture increased that factor. It also seems to increase towards rich mixtures. In rich mixtures acceleration of the flame could be observed even when it had passed over the turbulent zone. GRA

N75-26080# North Carolina Univ., Chapel Hill. William R. Kenan, Jr. Labs. of Chemistry.

ENERGY WORKSHOP ON ELECTROCHEMISTRY. A REPORT ON DISCUSSION OF ENERGY-RELATED BASIC RESEARCH IN ELECTROCHEMISTRY Final Report

Robert A. Osteryoung and Royce W. Murray Sep. 1974 56 p refs Workshop held at Chapel Hill, N. C., 27-28 Jul. 1974

(Grant NSF GP-43808)

(PB-240132/1; UNC-100) Avail: NTIS HC $4.25 CSCL 07D

This energy workshop is a discussion and identification by academic and industrial scientists of opportunities for fundamental research in basic electrochemistry and aspects of basic electrochemistry. Basic subjects include electrode kinetics, surface structure, photo-electrochemistry, organic electrochemistry, electroanalysis, and cell materials. Applied areas are primary and secondary batteries, fuel cells, corrosion, and industrial electrolysis. GRA

N75-26081# Battelle Columbus Labs., Ohio.

IMPLEMENTATION OF A COMPUTER-BASED INFORMATION SYSTEM FOR MASS SPECTRAL IDENTIFICATION Environmental Protection Technology Series

James R. Hoyland and Maynard B. Neher Jun. 1974 50 p refs

(Grant EPA-R-800921)

(PB-239933/5; EPA-660/2-74-048) Avail: NTIS HC $3.75 CSCL 07D

A computer program was developed for remote identification of mass spectra. Careful software design has led to a powerful and efficient system with minimum dialog and a highly flexible data input routine. Users may either access the main spectral library or create special libraries of their own. In addition, programs were developed for the PDP-8/e or PDP-8/m computer of the System/150 to abbreviate spectra, punch spectra on tape, or to send spectra directly from the PDP-8 via a serial line interface. GRA

N75-26082# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
SYNTHESIS OF RUTILE FROM DOMESTIC ILMENITES Report of Investigations, 1969 - 1973
G. W. Elger, D. E. Kirby, S. C. Rhoads, and W. A. Stickney Dec. 1974 24 p refs
(PB-240100/8; BM-RI-7985) Avail: NTIS HC $3.25 CSCL 08I

Laboratory tests show that ilmenite concentrates with titanium dioxide contents as low as 33 wt-pct can be beneficiated to produce a crystalline substitute for natural rutile suitable for direct chlorination. The synthesized product prepared by a three-step procedure was comparable to natural rutile in titanium content. Reduction smelting of ilmenite removes iron as a pig iron byproduct, and the remaining slag phase is greatly enriched in titanium. Oxidation of the slag in the presence of a phosphorus-bearing slag additive converts the titanium-bearing phases to discrete rutile crystals and a glass phase containing most of the associated impurities. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-26083 British Library Lending Div., Boston Spa (England).
EFFECT OF LOW CYCLE STRESSES ON THE CREEP RESISTANCE OF LOW ALLOY Cr Mo V STEELS
R. Pokorney 11 Nov. 1974 8 p Transl. into ENGLISH from Neue Huette (West Germany), vol. 18, no. 9, Sep. 1973 p 557-560
(BLL-CE-Trans-6555-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Low cycle stresses occur in steam turbines during starting and shut down. The resulting additional stresses may adversely affect the operational reliability of structural parts. With the changeover to increasingly larger power units, which have to be shut down at regular intervals, the problem of operational reliability becomes important. To determine the effect of the additional stresses on the operational reliability of turbine materials, creep resistance tests at constant tensile load and additional low cycle stresses at periodically changing temperature are described. Author

N75-26084 British Library Lending Div., Boston Spa (England).
DETERMINATION OF NITROGEN IN STEELS WITH USE OF THE EXHALOGRAPH EA-1 FITTED WITH AN ADDITIVE NITROGEN ANALYSER
K. Styblo and T. Holek 14 May 1974 9 p refs Transl. into ENGLUSH from Hutn. Listy (Czechoslovakia), v. 28, no. 2, 1973 p 143-145
(BLL-CE-Trans-6406-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

An evaluation was made of procedures used to extract N2 from steel melts. The methods were evaluated as a function of accuracy and time needed to complete the analysis. Performance data for each method are given in tabular form. E.H.W.

N75-26085 British Library Lending Div., Boston Spa (England).
CRACKING OF CARBON STEELS IN ALKALINE SOLUTIONS
G. V. Karpenko 18 Feb. 1975 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 202, no. 3, 1972 p 649-651
(BLL-CE-Trans-6237-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The formation conditions and the role of the oxide layers in the generation and development of cracks are discussed. The intensity of hydrogeneration of the metal during its reaction with the electrolyte, and the effect of the concentration of the solution on the tendency of pliable and high strength steels to crack in heated alkaline solutions were investigated to explain the destruction mechanism. Experiments were carried out under conditions of steady-state potential with the monoaxial expansion of cylindrical test pieces made from standardized Armco iron, 16 GNMA steel, and chilled (low-tempered) 40X steel. Author

N75-26086 Stanford Univ., Calif.
THE STRUCTURE AND MECHANICAL PROPERTIES OF PHYSICALLY VAPOR DEPOSITED CHROMIUM Ph.D. Thesis
Timothy Clark Reiley 1975 194 p
Avail: Univ. Microfilms Order No. 75-13583

The physical vapor deposition (PVD) process and its application to the synthesis of bulk materials was studied. In the experiments described, in which chromium was the evaporant material, high rate evaporation in vacuum was accomplished using an electron beam power source. Evaporated material was condensed in the form of thick films (up to 0.1 cm). Many of the processing variables associated with evaporation and condensation during PVD were examined. A theoretical description of the mass flux based on the curvature of the evaporation source was developed. This description provides an explanation of the observed deposit thickness profiles. The effects of deposition temperature, deposition rate and background pressure on the PVD structure were studied. It is found that over a wide range of conditions a columnar grain structure, with grains having a sub-micron diameter, can be achieved. Dissert. Abstr.

N75-26087*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A ZIRCONIUM MODIFIED NICKEL-COPPER ALLOY Patent Application
John D. Whittenberger, inventor (to NASA) Filed 5 Jun. 1975 12 p
(NASA-Case-LEW-12245-1; US-Patent-Appl-SN-584094) Avail: NTIS HC $3.25 CSCL 11F

An improved material for use in a catalytic reactor is reported. The material reduces nitrogen oxide from internal combustion engines and is in the form of a zirconium modified, precipitation strengthened nickel-copper alloy. This material has a nominal composition of Ni-30 Cu-0.2 Zr and is characterized by improved high temperature mechanical properties. NASA

N75-26088# Joint Publications Research Service, Arlington, Va.
REFINING BY REMELTING
B. Ye. Paton 10 Jun. 1975 281 p refs Transl. into ENGLISH from Rafiniruyushchiye Pereplavy (Kiev), no. 2, 1975 p 1-247 (JPRS-64965) Avail: NTIS HC $8.75

Problems of producing pure and ultrapure metals and alloys by the methods of specialized electrometallurgy are investigated, including electroslag, electron beam, and plasma arc refining remelting. For individual titles, see N75-26089 through N75-26092.

N75-26089 Joint Publications Research Service, Arlington, Va.
ELECTROSLAG REMELTING
B. Ye. Paton and B. I. Medovar *In its* Refining by Remelting (JPRS-64965) 10 Jun. 1975 p 2-145 Transl. into ENGLISH from Rafiniruyushchiye Pereplavy (Kiev), no. 2, 1975 p 3-17 (For availability see N75-26088 17-26)

Various aspects of electroslag remelting are considered, such as heat transfer from the slag pool, ingot surface formation, oxygen converter and electroslag furnace duplex process, and transformation and removal of nonmetallic inclusions. Mathematical models are presented on automatic control of the basic parameters and of the solidification process of a hollow electroslag ingot. Power modulation and split electrode methods are discussed for electroslag production. Problems concerning the mechanical properties of slags and foaming of metal slags are also described. J.A.M.

N75-26090 Joint Publications Research Service, Arlington, Va.
ELECTRON BEAM REMELTING
A. L. Tikhonovskiy *In its* Refining by Remelting (JPRS-64965) 10 Jun. 1975 p 146-175 refs Transl. into ENGLISH from Rafiniruyushchiye Pereplavy (Kiev), no. 2, 1975 p 125-131 (For availability see N75-26088 17-26)

Chemical composition variations of steels and alloys are calculated during electron beam remelting. Plane beam electron guns for melting and evaporating materials are discussed, along with an electron beam unit for obtaining monolithic and multilayered cast slabs. Structure and mechanical properties of thick vacuum condensates of iron are reviewed. J.A.M.

N75-26091 Joint Publications Research Service, Arlington, Va.
PLASMA ARC REMELTING
V. I. Lakomskiy, G. M. Grigorenko, and G. F. Torkhov *In its* Refining by Remelting (JPRS-64965) 10 Jun. 1975 p 176-228 refs Transl. into ENGLISH from Rafiniruyushchiye Pereplavy (Kiev), no. 2, 1975 p 151-159 (For availability see N75-26088 17-26)

Processes and parameters of the interaction of nitrogen with metal during plasma arc remelting are studied. The effect of molybdenum and tungsten on nitrogen solubility in iron-based alloys is examined, as well as nitrogen behavior in R6M5 steel. Laws of evaporation and variation of chemical composition of slags during plasma-slag remelting are reviewed. The effectiveness of removing hydrogen from a plasma-forming gas in a recirculation system is also considered. J.A.M.

N75-26092 Joint Publications Research Service, Arlington, Va.
FOREIGN INFORMATION
T. V. Novikova *In its* Refining by Remelting (JPRS-64965) 10 Jun. 1975 p 229-264 Transl. into ENGLISH from Rafiniruyushchiye Pereplavy (Kiev), no. 2, 1975 p 195-197 (For availability see N75-26088 17-26)

Electroslag refining (ESR) is applied to superalloy production instead of vacuum arc melting; ESR was found to outperform vacuum methods in superalloy production. Soviet ESR bearing steel is briefly examined, along with an ESR device operating in Sweden. J.A.M.

N75-26093*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF TIN AND TIN ALLOYS FROM MINUS 100 C TO 150 C
Donald H. Buckley Washington Jun. 1975 13 p refs
(NASA-TN-D-8004; E-8230) Avail: NTIS HC $3.25 CSCL 11F

Sliding friction experiments were conducted with an iron (110) single-crystal pin sliding on single and polycrystalline tin and tin alloys. Specimens were examined at various ambient temperatures from -100 to 150 C. Applied loads varied from 1 to 50 grams, and sliding velocity was constant at 0.7 mm/min. Results indicate that the crystal transformation of tin influences the friction coefficient. Friction was higher for the diamond structure (gray tin) than it was for the body-centered tetragonal structure (white tin). Bismuth arrested the crystal transformation, which resulted in constant friction over the temperature range -100 to 150 C. Both copper and aluminum enhanced the kinetics of transformation, with aluminum producing a nearly twofold change in friction with the crystal transformation. Author

N75-26094*# IIT Research Inst., Chicago, Ill. Metals Research Div.
THERMAL FATIGUE AND OXIDATION DATA ON TAZ-8A, MAR-M 200, AND UDIMET 700 SUPERALLOYS
Maurice A. H. Howes 15 Jan. 1975 41 p refs
(Contract NAS3-17787)
(NASA-CR-134775; IITRI-B6124-21) Avail: NTIS HC $3.75 CSCL 11F

The fluidized bed technique was used to determine the relative thermal fatigue and oxidation resistance of three superalloys: TAZ-8A, Mar-M 200, and Udimet 700. The alloys TAZ-8A and MAR-M 200 were also tested in the directionally-solidified form. For the 13 combinations of composition, solidification method, surface protection, and specimen geometry, the cycles to cracking varied from 1250 to 15,000. The alloy/coating having the best resistance to thermal fatigue cracking was coated directionally-solidified NASA TAZ-8A. This combination also had excellent oxidation resistance. Author

N75-26095# Missouri Univ., Rolla. Dept. of Engineering Mechanics.
MECHANICAL BEHAVIOR OF 6061 - T651 ALUMINUM
Patrick Davidson and Robert Davis 23 Jun. 1975 32 p refs Backup document for AIAA Synoptic scheduled for publication in the AIAA Journal in Nov. 1975
Avail: NTIS HC $3.75

An experimental testing program was conducted to determine the effects of stress state and temperature on the mechanical properties of 6061-T651 aluminum. From the data obtained at the yield and ultimate points, a yield and ultimate plot was developed based upon the parameters effective stress, effective strain, and the hydrostatic component of stress. This model illustrates the onset of plastic deformation and the occurrence of fracture, and was obtained solely from the data acquired from a uniaxial tensile specimen tested at various pressures and temperatures. Two other loading paths, biaxial tension and torsion, were used to verify the accuracy of the plot. From the testing program data were also obtained regarding the effects of the pressure and temperature environments on the other material properties such as Young's Modulus, Poisson's Ratio, toughness and ductibility. Author

N75-26096*# Ohio State Univ. Research Foundation, Columbus. Dept. of Metallurgical Engineering.
EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM AND ITS ALLOYS Final Report, Jan. 1972 - Jun. 1975
F. H. Beck Jun. 1975 145 p refs
(Grant NGL-36-008-051)
(NASA-CR-134796) Avail: NTIS HC $5.75 CSCL 11F

Occluded hydrogen resulting from cathodic charging of commercially pure titanium and titanium alloys, Ti-8Al-1Mo-1V and Ti-6Al-4V, was shown to cause embrittlement of the alloys. Embrittlement was a function of the interstitial hydrogen content rather than the amount of precipitated titanium hydride. The effects of hydrogen concentration on the critical strain for plastic instability along pure shear directions was determined for alloys Ti-8Al-1Mo-1V and Ti-5Al-2.5Sn. Hydrogen, in concentrations below that necessary for spontaneous hydride precipitation, increased the strain necessary for instability formation or instability failure. The strain rate sensitivity also increased with increasing hydrogen concentration. The effect of hydrogen on slip and twinning was determined for titanium single crystals. The critical resolved shear stress for prism slip was increased and the critical resolved shear stress for twinning was decreased with increasing hydrogen concentration. Author

N75-26097# Bureau of Mines, Reno, Nev. Metallurgy Research Center.
ELECTROCHEMICAL ANODIC REACTION RATE OF VANADIUM METAL WITH MOLTEN VC12-VC13-NaCl MIXTURES Report of Investigations, 1974
A. E. Raddatz and D. J. MacDonald Dec. 1974 14 p refs
(PB-240147/9; BM-RI-7986) Avail: NTIS HC $3.25 CSCL 11F

The Bureau of Mines has determined the electrochemical rate of anodic dissolution of vanadium metal in a VC12-VC13-NaCl electrolyte at 860C for the purpose of elucidating the reaction mechanism. Rate measurements were carried out with the help of specially designed equipment capable of continuously recording the weight-loss experienced by a cylindrical vanadium anode immersed in the molten salt electrolyte while a constant current is maintained through it. The rate is expressed as a function of current density and VC13 concentration and the reaction is interpreted in terms of an adsorption mechanism. The rate equation was obtained by multiple regression analysis. GRA.

N75-26098# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
PREPARATION OF A COPPER-TUNGSTEN COMPOSITE BY DIFFUSION WELDING
V. G. Budueba, Z. G. Fridman, V. E. Skazin, V. S. Morozov, and L. M. Svizina 1974 12 p refs Transl. into ENGLISH from Fizika i Khimiya Obrabotki Materiolov (USSR), v. 1, 1971 p 107-111 Sponsored in part by NSF
(TT-74-58008; DMDC-14072) Avail: NTIS HC $3.25 CSCL 11F

The optimum conditions for the diffusion welding of copper and tungsten were researched. Temperatures ranged from 700 to 1000C and pressures from 500 to 5000 kg/sq mm. Mathematical relationships were determined to describe the joining processes. Temperature was found to be the most important variable (rather than pressure). GRA

N75-26099# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
THE RATE OF DIFFUSION OF HYDROGEN AT HIGH TEMPERATURES THROUGH CONSTRUCTIONAL STEEL

R. A. Ryabov and P. V. Geld 1974 16 p refs Transl. into ENGLISH from Tr. Uralskii Politekhnicheskii Inst. im. S. M. Korova (USSR), v. 72, 1957 p 160-172 Sponsored in part by NSF (TT-74-58013; DMDC-14209) Avail: NTIS HC $3.25 CSCL 11F

The permeability of hydrogen in seven steels containing a variety of alloying additions (C, Cr, Si, Mn, Mo, S, P) was investigated over the temperature range 300 to 1000C. The diffusion behavior was complex and a function of composition. Activation energies were calculated in some cases. GRA

N75-26100# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

STUDY OF SELF-DIFFUSION ON SURFACES (100), (110), AND (111) OF COPPER SINGLE CRYSTALS BY METHOD OF SCRATCH SMOOTHING

D. V. Khai 1974 13 p Transl. into ENGLISH from Fiz. Metal. i Metalloved. (USSR), v. 35, no. 3, 1973 p 649-653 Sponsored in part by NSF
(TT-74-53073; DMDC-13705) Avail: NTIS HC $3.25 CSCL 11F

The temperature and orientation dependence of the surface self-diffusion of copper over the temperature range 744 to 1005C was investigated. Volume diffusion coefficients were also measured. Activation energies and pre-exponential factors are calculated from the exponential data. GRA

N75-26101# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

CHANGES IN INTERDIFFUSION PARAMETERS OF COPPER AND NICKEL IN RELATION TO THE DEGREE OF PRELIMINARY PLASTIC DEFORMATION

N. N. Sakabaeva 1974 10 p Transl. into ENGLISH from Tr. Akad. Nauk Kazakhshoi SSR, Alma Ata. Inst. Yadernoi Fiz. (USSR), v. 12, 1971 p 65-69 Sponsored in part by NSF
(TT-74-58020; DMDC-14466) Avail: NTIS HC $3.25 CSCL 11F

The rate of interdiffusion between copper and nickel was experimentally determined to vary with the degree of deformation and time of the diffusion anneal. The activation energy for interdiffusion also varied with the degree of deformation and time of annealing. The rate of growth of the interdiffusion zone was related to the degree of deformation. Microhardness readings indicated concentration dependence and degree of recrystallization. GRA

N75-26102# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

HIGH-TEMPERATURE OXIDATION AND WEAR RESISTANCE OF COPPER DIFFUSION-SATURATED BY ALUMINUM, NICKEL, AND ZIRCONIUM

N. G. Vavilovskaya and L. G. Timonina 1974 7 p Transl. into ENGLISH from Zashchitnye Pokrytiya Met. (Mashgiz), v. 5, 1971 p 177-179 Sponsored in part by NSF
(TT-74-58009; DMDC-14086) Avail: NTIS HC $3.25 CSCL 11F

The surface of copper specimens were saturated with aluminum, nickel, and zirconium metals by packing the copper in powders of the respective metals (or combinations eq. aluminum and nickel, aluminum and zirconium) and interdiffusing them at temperatures ranging from 850 to 950C. The resulting interdiffusion zones were studied with microhardness readings, X-rays, and metallographic examination. These same specimens were then oxidized in air at 850C for 25 hours. The wear resistance and oxidation resistance of the surface-alloyed specimens was greater than the unprotected copper metal. GRA

N75-26103# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

POLYTHERMS OF THE VISCOSITY AND SELF-DIFFUSION OF MOLTEN ALUMINIUM

E. S. Levin 1974 23 p refs Transl. into ENGLISH from Akad. Nauk SSSR Metally (USSR), no. 5, 1971 p 72-78 Sponsored in part by NSF
(TT-74-53089; DMDC-11882) Avail: NTIS HC $3.25 CSCL 11F

The temperature dependence of the viscosity of molten aluminium was measured in the temperature range 660 to 1550C. Self-diffusion coefficients were calculated using the Stokes-Einstein relation. GRA

N75-26104# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

METALLIZATION ON CUBIC BORON NITRIDE

Yu. V. Naidich, A. S. Vishrevskii, G. A. Kolesnichendi, E. M. Chistyakov, and E. D. Yakunova 1974 7 p Transl. into ENGLISH from Smaivemost i Poverknostnye Svoistva Rasplavov i Tverdyh Tel (USSR), v. 12, 1972 p 179-181 Sponsored in part by NSF
(TT-74-58023; DMDC-14736) Avail: NTIS HC $3.25 CSCL 11F

Cubic boron nitride was immersed in molten alloys of Cu-Ti, Ag-Ti, Cu-Ag-Ti and Cu-Sn-Ti after which the specimens were examined in an electron microprobe analyzer for penetration of Cr and Ti. Metallographic examination was employed in the study of phases formed during immersion. GRA

N75-26105# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

DIFFUSION COEFFICIENTS IN MOLTEN METALS

V. I. Kononenko and S. P. Yatsenko 1974 10 p refs Transl. into ENGLISH from Tr. Akad. Nauk SSSR. Yralskii Filial (Sverdlovsk), v. 23, 1971 p 62-67 Sponsored in part by NSF
(TT-74-58011; DMDC-14094) Avail: NTIS HC $3.25 CSCL 11F

The self diffusion coefficients of indium and tin were determined experimentally in not only the pure metals but a wide range of binary liquid indium-tin alloys over the temperature range 800 to 1100 K. Activation energies and pre-exponential factors were calculated for each metal. A break in the Arrhenius plot was found. Coefficients of diffusion for Ag, In, Th, Sn, Pb, Sb, and Bi in liquid gallium were calculated from viscosity data. GRA

N75-26106# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

METHODS OF DETERMINING GRAIN BOUNDARY DIFFUSION COEFFICIENTS: EFFECT OF GRAIN BOUNDARY ORIENTATION AND PRECIPATION

B. I. Arkharov and A. A. Pentina 1974 50 p refs Transl. into ENGLISH from the book "Mezhkrismallumnaya Diffusiya i Adsorbtsiya" (USSR), 1958 p 119-139 Sponsored in part by NSF
(TT-74-53233; DMDC-8282) Avail: NTIS HC $3.75 CSCL 11F

Silver was diffused into polycrystalline specimens of copper and copper-antimony alloys at 650C. The diffusion of the silver was determined metallographically. The rate of grain boundary diffusion was noted as a function of the orientation of the adjacent grains. GRA

N75-26107# Naval Research Lab., Washington, D.C.

CORROSION OF METALS IN TROPICAL ENVIRONMENTS. PART 10: FINAL REPORT OF SIXTEEN-YEAR EXPOSURES Final Report

C. R. Southwell and J. D. Bultman 2 Jan. 1975 40 p refs (NRL Proj. G04-03; RR1310341)
(AD-A003909; NRL-7834) Avail: NTIS CSCL 11/6

A comprehensive long-term investigation of corrosion of 52 metals immersed in seawater and in fresh water, suspended at mean-tide level, and exposed to marine and inland tropical atmospheres has been completed for exposure periods of up to 16 years. A series of reports on specific metal groups has already been published. This is a final report on the project: it presents tabulated results for all metal-environment combinations included in the study, both for simple plates and bimetallic couples. Many of these are previously unreported data. Time-corrosion curves for all single-metal exposures not previously reported on to completion are included; these are for 16 wrought and cast ferrous metals in two atmospheres and 7 nonferrous metals in all five environments. Because of their basic value for comparing corrosiveness of environments and for evaluating effectiveness of alloys, curves for all the commercially pure metals are presented for all five environments. The final steady-state corrosion rate is a most useful value for estimating expected metal life; this value (R sub c) has been established for most metals in each

environment and is included with all curves and tabulated data. GRA

N75-26108# Massachusetts Inst. of Tech., Cambridge. Materials Processing Lab.
THE DELAMINATION THEORY OF WEAR Annual Progress Report, May 1973 - Jun. 1974
Nam P. Suh, Said Jahanmir, and Ernest P. Abrahamson, II Sep. 1974 155 p refs
(Contract N00014-67-A-0204-0080; NR Proj. 229-011)
(AD-A003583) Avail: NTIS CSCL 11/6

The delamination theory of wear and the supporting experimental evidence are presented. The theory is valid when there is no significant temperature rise at the surface to induce any phase transformation and thermally activated diffusion of elements. It is shown that at low sliding speed the wear of metals occurs by subsurface deformation which induces void and crack nucleation and subsequent crack propagation parallel to the surface. The cracks eventually propagate to the surface producing thin wear sheets. This phenomenon has been observed on a variety of metals from soft cadmium to fully hardened AISI 4340 steel. The delamination theory of wear predicts that the best method of preventing wear is to use a material without large second phase particles or inclusions. For example, annealed zone refined iron has 1/3 the wear rate of AISI 1020 steel. Another prediction of the theory is that a thin layer of a soft metal on a hard substrate should reduce the wear rate because the dislocations are not stable in the thin layer. It is shown that a 0.1 micrometer cadmium coating on both contacting surfaces of AISI 1018 steel reduces wear by three orders of magnitude over the unplated steel. This coating is effective in an inert atmosphere, inert oil, but is not effective in an oxidizing atmosphere. GRA

N75-26109# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
ASPECTS OF STRESS CORROSION Final Report
William A. Tiller Nov. 1974 10 p
(Grant AF-AFOSR-2206-72; AF Proj. 9761; AF Proj. 6813)
(AD-A003740; SU-DMS-75-T-10; AFOSR-74-1917TR) Avail: NTIS CSCL 11/6

The objective of this research was to develop a new approach to stress corrosion and the attendant cracking that accompanies it. The rate of formation of a surface notch in a single crystal material has been theoretically evaluated using first order perturbation theory and shown to depend upon the eighth power of the macroscopic stress for both surface diffusion, volume diffusion and dissolution mechanisms. An experimental study of S.C.C. of austenitic stainless steels in hot halide environments has revealed the presence of martensite on the fracture surfaces whereas it does not form in the bulk at that temperature. This suggests that martensite assists in the kinetics of crack propagation in these environments. The change of work function of copper single crystals by both elastic and plastic compressive strain has been determined. The plastic strain effect is not consistent with theory. GRA

N75-26110# Ohio State Univ. Research Foundation, Columbus.
INVESTIGATION OF HIGH TEMPERATURE OXIDATION REACTIONS Final Report, 1 Apr. 1971 - 31 Oct. 1973
Robert A. Rapp and John P. Hirth Oct. 1974 23 p refs
(Contract F33615-71-C-1492)
(AD-A004169; OSURF-3194-F; ARL-74-0126) Avail: NTIS CSCL 11/6

High temperature oxidation reactions were studied, with detailed experimental investigation of two problems: (1) the compatibility of components in multi-phase, high temperature systems as exemplified by displacement reactions in the solid state, and (2) the high temperature oxidation of Ni-Cr-W and Co-Cr-W alloys. In the study of isothermal displacement reactions between less stable compounds and more reactive metals at 1000 degrees centrigrade, a theory evolved to explain three observed product morphologies: layered, aggregate-lamelar, and aggregate-interwoven. A detailed theory was presented and tested to interpret the aggregate-lamellar product microstructure of the Iron/Cuprous Oxide couple. The effect of tungsten additions on the oxidation behavior of Nickel-20 Chromium alloys and of Cobalt-30 Chromium alloys was studied by thermogravimetric, electron microprobe, and metallographic methods. For each set of alloys a partitioning of W to the metallic phase was found, and the resulting phase changes were interpreted in terms of the ternary phase diagrams for the alloys. GRA

N75-26111# Cornell Univ., Ithaca, N.Y.
THE STRUCTURE AND DECOMPOSITION OF TITANIUM AND ZIRCONIUM BCC SOLID SOLUTIONS Final Report
Stephen L. Sass Dec. 1974 23 p refs
(Contract N00014-67-A-0077-0012; NR Proj. 031-734)
(AD-A003552; TR-12) Avail: NTIS CSCL 11/6

The research was concerned with studying the structure, the mechanical properties and the decomposition of Ti and Zr b.c.c. (e.g. Zr-Nb, Ti-V) solid solutions. The experimental techniques used in this study were electron microscopy, electron diffraction, elastic constant measurements and single crystal tensile testing. The purpose of this Final Report is to review the highlights of the research and point out important results. GRA

N75-26112# Illinois Univ., Urbana. Dept. of Civil Engineering.
EFFECTS OF POROSITY ON THE FATIGUE PROPERTIES OF 5083 ALUMINUM ALLOY WELDMENTS Final Report
F. V. Lawrence, Jr., W. H. Munse, and J. D. Burk Dec. 1974 89 p refs
(Contract N00024-73-C-5344)
(AD-A003938) Avail: NTIS CSCL 11/6

The results of the investigation indicate that 5083-5183 welds subjected to fatigue are little affected by porosity if the weld reinforcement is left in place. The weld reinforcement itself is the critical and fatigue limiting notch. Most welds tested with their reinforcement removed gave longer fatigue lives than as-welded tests regardless of porosity level. Porosity most influenced the fatigue lives of the reinforcement removed tests at the lowest stress levels. The radiographic standards currently in use by the U.S. Navy were found to be effective in insuring superior results with reinforcement removed welds. Conversely, few reinforcement removed welds which failed these standards gave shorter fatigue lives than porosity-free, as-welded welds. GRA

N75-26113# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
THE ROLE OF PASSIVE FILM GROWTH KINETICS AND PROPERTIES IN STRESS CORROSION AND CREVICE CORROSION SUSCEPTIBILITY Technical Summary Report, 1 Mar. - 31 Dec. 1973
J. Kruger and J. R. Ambrose Sep. 1974 89 p refs
(NR Proj. 036-082)
(AD-A003900; NBSIR-74-583; TSR-5) Avail: NTIS CSCL 11/6

A study of the effect of alloying chromium and molybdenum in ferritic stainless steels has been made using techniques to study repassivation kinetics (tribo-ellipsometry) and depassivation kinetics (a recently developed ellipsometry technique for studying optical changes occurring within a crevice). Constant strain rate studies were performed using AISI 304 stainless steel exposed to acidified 1.0N NaCl solution (pH=3.0). In this particular environment, repassivation kinetics measurements using the tribo-ellipsometric technique had shown that the metal dissolution rates were rather large due to reduced film repair kinetics, indicating the possibility of susceptibility to stress corrosion cracking (SCC). Reduced time to failure and maximum sustained load at a one strain rate suggest a relationship between SCC, repassivation kinetics, and rate of pure metal production. A review of current approaches to the study of stress corrosion and a discussion of how these approaches can lead to new failure prediction tools is given. GRA

N75-26114# Naval Postgraduate School, Monterey, Calif.
A CRITICAL ANALYSIS OF FATIGUE-CRACK PROPAGATION DATA FOR 2024-T3 ALUMINUM M.S. Thesis
Robert Alan Kish Dec. 1974 62 p refs
(AD-A004232) Avail: NTIS CSCL 11/6

Fatigue-crack growth data for 2024-T3 aluminum was used to evaluate the accuracy of Forman's equation. Forman's equation was found to predict from one-third to twice the observed cycles to a given crack length when applied to multiple cyclic stress

ratios. An alternative approach was developed, based on the observed data, which is applicable to analog or digital fatigue-crack growth prediction. Data acquisition based on constant increment of crack length has been found to yield inadequate definition of the crack-growth curve in the low-cycle range for the successful application of the method. An expression was developed which extends the application of the crack-closure concept to the entire range of cyclic stress ratio. An effective root-mean-square stress was defined which shows indications of good correlation with the magnitude of the crack-growth curves. GRA

N75-26115# Ohio State Univ. Research Foundation, Columbus.
SURFACE PROPERTIES OF METALS Final Report, 1 Dec. 1971 - 31 Aug. 1974
John P. Hirth and Rudolph Speiser 31 Aug. 1974 22 p refs
(Grant AF-AFOSR-2242-72; AF Proj. 9761)
(AD-A003744; OSURF-3360-1; AFOSR-75-0022TR) Avail: NTIS CSCL 11/6

The electrical conductivities of discontinuous iron films deposited upon quartz and sodium chloride substrates under ultra-high vacuum have been measured. The influence of chemisorbed hydrogen and oxygen on the conductivity of these films has also been determined. The surface and interfacial energies of nickel and copper as a function of very low partial pressures of oxygen have been measured. GRA

N75-26116# Martin Marietta Aerospace, Denver, Colo.
THE INFLUENCE OF ENVIRONMENT ON CRACK BEHAVIOR Final Report
I. R. Kramer Aug. 1974 23 p refs
(Contract F44620-74-C-0032; AF Proj. 9782)
(AD-A003954; MCR-74-143-F; AFOSR-74-1908TR) Avail: NTIS CSCL 11/6

The analytical expressions presented in this report relate the crack velocity and the failure time to the surface-layer stress coefficient for compact-tension specimens of Ti-6Al-4V and a 4130 steel subjected to stress-corrosion cracking. The experimental data for the threshold stress intensity factor and the crack velocities for various stress intensity factors agree well with the calculated values. GRA

N75-26117# Texas A&M Univ., College Station. Dept. of Chemistry.
ORGANOMETALLOPORPHYRINS
Minoru Tsutsui and C. P. Hrung Nov. 1974 27 p refs Repr. from Ann. N. Y. Acad. Sci., v. 235, 1974 p 140-151
(Contract N00014-68-A-0308-0006; NR Proj. 356-559)
(AD-A003940; TR-6) Avail: NTIS CSCL 07/3

Progress in the field of chemistry of organometalloporphyrins is reviewed. The chemistry of vitamin B12, MP(Re(CO)3)2, (H-MP)-Re(CO)3, (H-MP)Tc-(CO)3, and others is discussed. GRA

N75-26118# Southwest Research Inst., San Antonio, Tex. Dept. of Materials Sciences.
INVESTIGATION OF THE CRACK TIP DEFORMATION CHARACTERISTICS OF SLOWLY GROWING FATIGUE CRACKS Final Technical Report
James Lankford, Jr. and David L. Davidson Dec. 1974 13 p refs
(Contract F44620-73-C-0040; AF Proj. 9761; SwRI Proj. 02-3618)
(AD-A003729; SwRI-02-3618-F; AFOSR-75-0029TR) Avail: NTIS CSCL 11/6

The technique of selected area electron channeling has been quantified and used to map the shape and quantitative strain distribution within the plastic zones attending fatigue crack tips in 304 stainless steel, 6061-T6 aluminum, and Fe-3Si steel. Simultaneously, crack tip opening displacement, the mechanisms of yielding and decohesion, and maximum shear strains have been measured using high magnification SEM of replicas. Overload plastic zones and their relation to fatigue crack retardation have been characterized. Observed values of all of these parameters have been compared with predictions of various analytical models. GRA

N75-26119# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHEMICAL INHOMOGENEITY OF WELD JOINTS OF ALUMINUM-BERYLLIUM ALLOY
M. A. Komarov and A.V. Lobzhanidze 19 Nov. 1974 9 p refs Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (USSR), no. 3, May/Jun. 1972 p 91-93
(FTD Proj. T74-01-40; FTD Proj. T74-01-41)
(AD-A004515; FTD-HC-23-2548-74) Avail: NTIS CSCL 13/5

The formation of inhomogeneity of distribution of beryllium over the cross section of weld joints of an aluminum-beryllium alloy was studied. This inhomogeneity is explained by a redistribution of beryllium due to a variable solubility at the solid-liquid interface. GRA

N75-26120# Ohio State Univ. Research Foundation, Columbus.
THE SUBLIMATION OF BASAL SURFACES OF ZINC OXIDE
J. E. McVickler, R. A. Rapp, and J. P. Hirth Dec. 1974 61 p refs
(Contract N00014-67-A-0232-0005; OSURF Proj. 2966; NR Proj. 036-047)
(AD-A004222; OSURF-2966-TR-9) Avail: NTIS CSCL 20/2

Basal surfaces of both undoped and lithium-doped single crystals of zinc oxide were sublimated under Langmuir free vaporization conditions and under various partial pressures of oxygen. The vaporization coefficient was lower for the (0,0,0,-1) surface than for the (0001) surface. Oxygen suppressed the sublimation rates except for the (0001) surface at high temperatures. Lithium doping produced a large increase in sublimation rates. An earlier theory of surface-charge influenced sublimation was modified to include specific effects of surface kinks, surface roughening, and doping. The experimental results could be interpreted in terms of this modified theory. GRA

N75-26121# Naval Postgraduate School, Monterey, Calif.
THE RELATION OF LOW TEMPERATURE DEFORMATION AND SUSCEPTIBILITY TO HYDROGEN EMBRITTLEMENT OF AUSTENITIC STAINLESS STEELS M.S. Thesis
Peter Francis Scardigno Dec. 1974 114 p refs
(AD-A004555) Avail: NTIS CSCL 11/6

Two candidate materials for cryogenic service, commercial stainless steels 304-L, and 21-6-9, were used for the experiments. These materials were subjected to deformation at various strain rates and temperatures in an attempt to induce partial and/or complete martensitic transformation. The two alloys were then subjected to interrupted tensile tests at various temperatures in which samples were exposed to a cathodic hydrogen charging procedure at various values of tensile pre-strain. Fractographic and metallographic analysis of fractured specimens were performed. The combined effect of hydrogen embrittlement and phase transformation is discussed. GRA

N75-26122# Dayton Univ. Research Inst., Ohio.
FRACTURE RELATED PROPERTIES OF X-2048-T851 PLATE INCLUDING SPECIMEN SIZE EFFECTS ON KIC Final Report, Sep. 1973 - Aug. 1974
G. J. Petrak Dec. 1974 37 p refs
(Contract F33615-74-C-5024; AF Proj. 7381)
(AD-A004199; UDRI-TR-74-27; AFML-TR-74-261) Avail: NTIS

Mechanical property data were developed on a new aluminum alloy that is designated as X2048. The material, which was tested in the -T851 condition, was developed by its manufacturer, Reynolds Aluminum, to possess the strength, fatigue resistance, thermal stability and corrosion resistance of 2024-T851 and 2124-T851 while at the same time having increased toughness. It was shown that the strength and fatigue crack growth rate of X2048 are the same as 2024 and 2124 and that the X2048 possesses increased toughness. A limited corrosion study using precracked specimens showed the material to be unaffected by a salt water environment under the test conditions. The room temperature fracture test results were dependent on specimen size with larger specimens producing higher fracture toughness test data. Fracture toughness test data from the literature that was obtained using bend specimens were lower than the fracture toughness results obtained in this effort which employed compact tension specimens. GRA

N75-26123# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.

FUNDAMENTALS OF KINETIC THEORY: A METHOD BY N. N. BOGOLYUBOV
K. P. Gurov 1972 475 p refs Transl. into ENGLISH of the book "Ocnovaniya kineticeskoi teorii metod N. N. Bogolyubov" Moscow, 1966 Sponsored in part by NSF
(TT-72-58029; DMDC-11387) Avail: NTIS HC $11.50 CSCL 11F

This book is devoted to the general kinetic theory of gaseous systems (ideal gases, electron gas in metals, etc.). A derivation of the kinetic equation, based on a method suggested by academician N.N. Bogoliubov, is described in detail. An analysis of these equations is carried out. Methods for their solution are given. A method is developed for obtaining the explicit forms of the kinetic coefficients (viscosity, thermal conductivity, etc.). Mathematical methods of the theory, as applied to quantum systems, are discussed in complete detail. In conclusion, a number of concrete problems concerning metal optics and diffusion in metals and alloys are considered. GRA

N75-26124# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
IONIC CONDUCTION IN METALS AND SEMICONDUCTORS (ELECTROTRANSPORT)
V. B. Fiks 1974 295 p Transl. into ENGLISH of the book "Ionnaya provodimost v metallah i poluprovodnikah (electroperenos)" Moscow, Izd. Nauka, 1969
(TT-74-58000; DMDC-12262) Avail: NTIS HC $8.75 CSCL 11F

This book reviews and discusses the phenomena of electrotransport in metals and semiconductors. Experiments and theories up to the year 1969 are reviewed. Particular attention is given to the concept of the electron wind. Solid as well as liquid metals are given special attention. GRA

N75-26125# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
EFFECT OF COPPER AND SILICON ON THE RATE OF DIFFUSION
A. P. Smiryagin and O. S. Kvurt 1974 15 p refs Transl. into ENGLISH from Tr. Gos. Nauchno-Issled. Proektn. Inst. Splavov Obrabotki Tsvetnykh Metallov (Moscow), no. 16, 1957 p 116-127 Sponsored in part by NSF
(TT-74-58006; DMDC-14035) Avail: NTIS HC $3.25 CSCL 11F

Radioactive iron-59 was diffused into specimens of pure nickel, nickel containing 1.26 to 5.1% Cu, and Ni containing 0.1 to 0.8% Si. The temperature of diffusion varied from 900 to 1050C. It was found that Cu affected the Fe-59 diffusion coefficient very little. On the other hand, Si hindered iron diffusion when present in quantities up of 0.5%. Increasing amounts of Si were found to cause an increase in the rate of iron diffusion. GRA

N75-26126# National Bureau of Standards, Washington, D.C.
ELECTRODEPOSITION OF METALS AND INHIBITING ADSORPTION
A. T. Vagramyan and M. A. Zhamagortsyants 1974 268 p refs Transl. into ENGLISH of the book "Elektroosazhdenie metallov i ingibiruyushchaya adsorbtsiya" Moscow, Izd. Nauka, 1969 257 p Sponsored in part by NSF
(TT-72-51030) Avail: NTIS HC $8.50 CSCL 11F

The principles of electrodeposition theory and the inhibition and adsorption behavior of metals were examined. Special attention was given to the electrodeposition of Au, Zn, Pb, Pd, Sn, and Re and its alloys. Chromium electrodeposition from its tri- and hex-avalent compounds was included. Data were also given on the dissolution and electrochemistry of Ga, Sb, Se, and metals of the Fe group. E.H.W.

N75-26127# General Electric Co., Schenectady, N.Y.
MACHINE CASTING OF FERROUS ALLOYS Final Technical Report, 1 Feb. 1973 - 30 Jun. 1974
M. F. X. Gigliotti, Jr. Oct. 1974 105 p refs
(Contract DAAG46-73-C-0111; ARPA Order 2267)
(AD-A003835; SRD-74-079; AMMRC-CTR-74-65) Avail: NTIS CSCL 13/8

A series of iron, nickel, and cobalt base alloys have been permanent mold cast under varying conditions to evaluate techniques for improving the integrity of die castings. By appropriate control of heat flow, it is possible to achieve permanent mold casting with mechanical properties equivalent to investment castings. Liquid-solid slurries were cast (Rheocasting) to evaluate casting properties and opportunities for enhanced mold life with a reduced temperature casting process. Casting properties are acceptable. It is not clear that there is enhanced mold life by this process. Stainless steel alloys were die cast at 34 - 105C superheats. These die castings indicate that there is sufficient heat loss in the shot sleeve and runner systems that the metal arrives in the die cavity partly solid. GRA

N75-26128# Aerojet Liquid Rocket Co., Sacramento, Calif.
STORABILITY INVESTIGATIONS OF WATER LONG-TERM STORAGE EVALUATION Annual Report
E. M. VanderWall and G. R. Janser Dec. 1974 65 p
(Contract F04611-72-C-0062; AF Proj. 3059)
(AD-A004462; AFRPL-TR-74-76; AR-1) Avail: NTIS CSCL 11/6

The objective of this program is to gather data that will permit the Air Force to assess the long term storage characteristics of water particularly with regard to formation of particulate matter, so that the feasibility of long-term storage of water for use as a transpiration coolant can be determined. Five metallic materials of construction are included in the program: 304 stainless steel, A-286 (aged) steel, 17-4 (aged) stainless steel, Inconel 718 (aged), 6Al-4V titanium (STA). Two types of water are used in the program: oxygen-saturated, deionized, filtered, and oxygen-free, deionized, filtered. Evaluation of water and containers stored for six-months and twelve-months has been completed. The data show that both oxygen-saturated and oxygen-free water can be stored in appropriate metal containers for the selected time periods without detrimental particulate matter formation or significant changes in the quality of the water. It is in excellent condition for transpiration coolant purposes. GRA

N75-26129# Calspan Corp., Buffalo, N.Y.
EXCITATION AND VAPORIZATION IN ALUMINUM AND URANIUM SUBJECTED TO HIGH PRESSURE SHOCKS Final Report, 1 May 1973 - 30 Aug. 1974
Robert A. Fluegge Jan. 1975 56 p refs
(Contract F30602-73-C-0157; ARPA Order 1649; AF Proj. 1649)
(AD-A004868; CALSPAN-WB-5320-A-1; RADC-TR-75-7) Avail: NTIS CSCL 07/4

Both uranium and aluminum were shock heated and subsequently allowed to expand into a large, high altitude test chamber. No free uranium atoms were observed. Electronically excited aluminum was seen at real times that corresponded to values which are 10,000 times longer than the known radiative lifetime of the states involved. This means that sizeable numbers of free aluminum atoms are created using shock heating techniques, and further that many of these same atoms are formed in a metastable state or states which lie several electron volts above the ground state. The effects of this metastable on the reaction chemistry are considered; electronically and vibrationally excited AlO can readily be formed if the postulated atomic metastable atom is the 4P state in served chemistry occurring during atmospheric release. GRA

N75-26130# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THERMAL RESPONSE OF TITANIUM TO LASER RADIATION INCLUDING THE EFFECTS OF THE OXIDATION REACTION M.S. Thesis
Harold E. Socolofsky Dec. 1974 53 p refs
(AD-A004322; GAE/MC/74-10) Avail: NTIS CSCL 11/6

Experimental results from laser heating of oxide-coated titanium show instances where the temperature of the back face of thin sheets increases more rapidly than if the front face had absorbed 100% of the laser energy. This paper considers the effects of the exothermic oxidation reaction of titanium as the possible source of the additional energy necessary to produce the observed heating rates. An expression is obtained for the rate of oxidation of titanium as a function of temperature and is incorporated into a numerical analysis of the heat flow problem. Two different models are proposed and examined to see if they can produce the necessary temperatures to create a significant

oxidation rate. It is concluded that the required additional energy to reproduce experimental results cannot be explained by the oxidation reaction as determined in this report. GRA

N75-26131# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
STANDARD REFERENCE MATERIALS: THERMAL CONDUCTIVITY AND ELECTRICAL RESISTIVITY STANDARD REFERENCE MATERIALS: AUSTENITIC STAINLESS STEEL, SRM'S 735 AND 798, FROM 4 TO 1200 K Final Report
J. G. Hust and P. J. Giarratano Mar. 1975 45 p refs
(COM-75-10339/0; NBS-SP-260-46; LC-75-619013) Avail: NTIS; SOD HC $1.00 as C13.10:260-46 CSCL 11F

A historical review of the development of selected thermophysical Standard Reference Materials, (SRM's) is given and selection criteria for those SRM's are listed. Thermal conductivity and electrical resistivity data for austenitic stainless steel, SRM's 735 and 798, are critically evaluated. Recommended values are presented for the temperature range 4 to 1200K. Material variability studies, including the effects of heat treatment, were performed. GRA

N75-26132# Illinois Univ., Urbana. Dept. of Civil Engineering.
EFFECT OF STRAIN RATE ON YIELD STRESSES OF MODEL REINFORCEMENT Civil Engineering Studies
Stephen R. Staffier and Mete A. Sozen Feb. 1975 76 p refs (Grant NSF ATA-74-22962)
(PB-239609/1; UILU-ENG-75-2002) Avail: NTIS HC $4.75 CSCL 11F

Dynamic tests were conducted on four types of steel wire specimens: (a) no. 8 gage black annealed wire, smooth surface, (b) no. 8 gage black annealed wire, knurled surface, (c) no. 11 gage black annealed wire, knurled surface, and (d) no. 8 gage bright basic wire, knurled surface. The effect of strain rates, ranging from 0.00017/sec. to 0.1/sec., on the upper and lower yield stresses of each specimen was obtained. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-26133 British Library Lending Div., Boston Spa (England).
RECENT STUDIES OF THE PLASTICITY LAWS OF POLYCRYSTALLINE METALS AT HIGH TEMPERATURE (WITH SPECIAL REFERENCE TO THE EFFECT OF HYDROSTATIC STRESS AND STRAIN HISTORY)
M. Ohnami 14 May 1974 25 p refs Transl. into ENGLISH from J. Soc. Mat. Sci. (Japan), vol. 20, no. 3, 1971 p 236-246
(BLL-CE-Trans-6301-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The current status of plasticity laws of polycrystalline metals and low carbon steels is reviewed. Descriptions are given of material fracture at high temperature, with special reference to the effects of hydrostatic stress and strain history. E.H.W.

N75-26134 British Library Lending Div., Boston Spa (England).
FRACTURE THEORIES IN THE INDUSTRIAL APPLICATION OF THERMOPLASTICS AND GFR PLASTICS
E. Gaube and H. H. Kausch 25 Jul. 1974 20 p refs Transl. into ENGLISH from Kunststoffe (Solothurn), v. 63, no. 6, 1973 p 391-397
(BLL-CE-Trans-6376-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The characteristic features of fracture formation in thermoplastic and graphite fiber reinforced plastics are indicated, and the problems arising in their application explained. The preparation of practical, economic, and reliable guidelines for the use of the plastic materials in question is discussed. Author

N75-26135 Rhode Island Univ., Kingston.
CERAMIC MATERIALS FOR SLIDING APPLICATIONS Ph.D. Thesis
Leung Kit Heung 1974 202 p
Avail: Univ. Microfilms Order No. 75-13696

The surface reactions of hot pressed silicon nitride are investigated along with the wear behavior of hot pressed silicon nitride, boron carbide, silicon carbide, reaction bonded silicon nitride, and silicon oxide nitride ceramic materials. The data suggests that the presence of impurities, such as magnesium and calcium lowers the oxidation resistance of silicon nitride in air. It is found that the surfaces exhibit areas of true polish, packed film, and loose debris after sliding contact in air. It is suggested that the presence of oxygen enhances a mechano-chemical wear process which produces true polish. The effect of surface topography on the friction and wear of ceramic materials is also investigated. A surface parameter, the incongruency index, relating frictional and wear characteristics is proposed. Dissert. Abstr.

N75-26136*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREPARATION OF DIELECTRIC COATINGS OF VARIABLE DIELECTRIC CONSTANT BY PLASMA POLYMERIZATION Patent Application
Martin Hudis (Allis-Chalmers Mfg. Co., Milwaukee) and Theodore Wydeven, inventors (to NASA) Filed 23 Jun. 1975 19 p
(NASA-Case-ARC-10892-1; US-Patent-Appl-SN-589172) Avail: NTIS HC $3.25 CSCL 07D

A plasma polymerization process for the deposition of a dielectric polymer coating on a substrate is disclosed. The process consists of disposing the substrate in a closed reactor between two temperature controlled electrodes connected to a power supply. A vacuum is maintained within the closed reactor, causing a monomer gas or a gas mixture of a monomer and a diluent to flow into the reactor. A plasma is generated between the electrodes. The dielectric constant of the polymer coating deposited by regulating the gas total and partial pressures, is controlled along with the electric strength and frequency, and the cu current density. A monomer, such as a polar saturated or unsaturated nitrogen-containing compound, or a monomer and diluent, such as a saturated or unsaturated aliphatic hydrocarbon and nitrogen, can by polymerized to form a dielectric coating having a varying dielectric constant in accordance with this plasma polymerization process. NASA

N75-26137*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF CARBON-GRAPHITE MATERIALS FOR HIGH ENERGY BRAKES
Robert C. Bill Washington Jun. 1975 28 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland (NASA-TN-D-8006; E-8259) Avail: NTIS HC $3.75 CSCL 11G

Caliper-type brakes simulation experiments were conducted on seven different carbon-graphite material formulations against a steel disk material and against a carbon-graphite disk material. The effects of binder level, boron carbide (B4C) additions, graphite fiber additions, and graphite cloth reinforcement on friction and wear behavior were investigated. Reductions in binder level and additions of B4C each resulted in increased wear. The wear rate was not affected by the addition of graphite fibers. Transition to severe wear and high friction was observed in the case of graphite-cloth-reinforced carbon sliding against a disk of similar composition. This transition was related to the disruption of a continuous graphite shear film that must form on the sliding surfaces if low wear is to occur. The exposure of the fiber structure of the cloth constituent is believed to play a role in the shear film disruption. Author

N75-26138*# Southern Univ., Baton Rouge, La. Dept. of Mechanical Engineering.
RADIATIVE PROPERTY INVESTIGATION Final Report
Robert L. Scott, Jr. [1975] 55 p
(Grant NsG-8016)
(NASA-CR-143041) Avail: NTIS HC $4.25 CSCL 11C

Measurements of the bidirectional reflections of NASA paints Z-93 and S-13G were made for 0.5, 1.78, and 2.5 microns, source incidence angles of 0, 30, 60, and 75 deg, and four detector azimuth positions. The bidirectional reflectance distribution was found to be near Lambert for azimuth positions not to

close to 180 deg from the source incident azimuth. The reflectance distribution at an azimuth of 180 deg from the source is close to Lambert for near normal source incidents angles, and becomes much larger than Lambert as the source incident angle approach grazing. The reflectance deviates from Lambert as the wavelength increases. Comparison of data for the paints shows Z-93 reflectance is much closer to Lambert than S-13G. When there is a peak in the reflectance distribution it occurred at the specular angle or an angle larger than the specular angle. Author

N75-26139*# IIT Research Inst., Chicago, Ill. Technology Center.
DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES **Triannual Report, 1 Jan. - 30 Apr. 1975**
Y. Harada and J. E. Gilligan Jun. 1975 34 p refs
(Contract NAS8-26791)
(NASA-CR-143879; IITRI-C6233-52) Avail: NTIS HC $3.75 CSCL 11D

Pigment manufacturing development, binder development, environmental effects evaluations, and general coatings investigations are discussed. The relative emphasis on each of these tasks varied according to the urgency of the problems elucidated and the availability of time and funds. Emphasis is placed on the development of a mixed oxalate precursor zinc orthotitanate pigment manufacturing method and related studies and on complementary environmental testing and evaluation activities. Author

N75-26140# Materials Research Labs., Maribyrnong (Australia).
IMPROVED ANTIFOULING BY MARINE COATINGS CONTAINING MIXED TOXICS
L. V. Wake Jan. 1975 19 p refs
(MRL-TN-363) Avail: NTIS HC $3.25

A series of test panels coated with antifouling paints and a series of rubber panels containing organotin compounds and/or a phytotoxic triazine were immersed at Williamstown Naval Dockyard to test for algicidal activity. The only panels free of macrofouling algae after six months were those containing both toxics. Author

N75-26141# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
THERMOMECHANICAL CREEP OF AGING CONCRETE: A UNIFIED APPROACH
J. H. Argyris, K. S. Pister, and K. J. Willam 1974 47 p refs Sponsored in part by Fulbright grant
(Grant SBB-4)
(ISD-167) Avail: NTIS HC $3.75

A unifying analytical structure is provided for studying creep of concrete subjected to uniaxial stress (loading and relieving) with simultaneous changes in temperature. A general thermomechanical creep equation was formulated, in which rate and history effects are reflected by internal variables, the evolution of which is modeled by first-order differential equations, expressing growth laws which determine the amount of creep. The total creep deformation is composed of instantaneous and delayed elastic parts as well as permanent flow. Introduction of the concept of an effective time permits representation of the creep law as a convolution integral, the corresponding kernel of which is the creep function. In addition to possessing a degenerate structure, leading to a numerical solution scheme, the model suggests test programs from which internal variable parameters can be evaluated from measurements of recoverable and permanent creep deformation as functions of time, loading age, and temperature. ESRO

N75-26142# Institut fuer Festkoerpermechanik, Freiburg (West Germany).
INVESTIGATIONS ON THE FRACTURE PROCESS IN POLYMETHYL METHACRYLATE OF DIFFERENT MOLECULAR WEIGHT
Walter Doell Aug. 1974 161 p refs In GERMAN; ENGLISH summary
(WB-4/74) Avail: NTIS HC $6.25

The fracture process in polymethyl methacrylates of different molecular weights under mode-I-loading was investigated with particular attention given to critical fracture initiation, fast crack propagation and crack branching. The general result is, that while the strain energy release rates both at critical crack initiation and at crack branching increase with molecular weight, the curves of crack velocity versus strain energy release rate flatten with increasing molecular weight, although reaching the same maximum crack velocity. Author (ESRO)

N75-26143# Agricultural Research Service, Washington, D.C.
EFFECT OF PRELIMINARY MERCERIZATION ON THE *STRENGTH OF COTTON FIBER AND YARN IN FINISHING* WITH DIMETHYLOLETHLENEUREA
L. V. Boguslavskaya 1974 9 p Transl. into ENGLISH from Tekstilnaya Prom. (USSR), no. 29(12), 1969 p 44-47 Sponsored in part by NSF
(TT-71-51025) Avail: NTIS HC $3.25 CSCL 11E

The laws were studied which govern the changes in the physical and chemical properties of cotton fibers, and yarns made out of them. Preliminarily bleached and mercerized cotton under various conditions of tension (in free state, under conditions of constant dimensions as well as under conditions involving stretching) and subsequently finished with dimethylol-ethyleneurea in accordance with the accepted technology for permanent finishing is included. GRA

N75-26144# California Univ., Los Angeles. School of Engineering and Applied Science.
STRUCTURE AND PROPERTIES OF GLASSES UNDER PRESSURE AS RELATED TO STRUCTURAL, OPTICAL AND ELECTRONIC PROPERTIES **Final Scientific Report, 1 Sep. 1969 - 31 Aug. 1974**
John D. Mackenzie 1975 19 p refs
(Grant AF-AFOSR-1856-70; AF Proj. 9536)
(AD-A003726; AFOSR-75-0032TR) Avail: NTIS CSCL 11/2

The flow and ionic conductivity of oxide glasses have been studied as a function of temperature and volume by the application of pressure. The results were related to hardness and chemical strengthening of glasses. Theoretical expressions have been derived to calculate hardness and elastic modulus from chemical composition. From such understanding, new glasses of high hardness have been made. GRA

N75-26145# Naval Ordnance Lab., White Oak, Md.
FACTORS LIMITING THE TENSILE STRENGTH OF PAN-BASED CARBON FIBERS
F. Robert Barnet and Marriner K. Norr 22 Nov. 1974 18 p refs
(AD-A003898; NOLTR-74-172) Avail: NTIS CSCL 11/5

This report explores the factors controlling the tensile strengths of carbon fibers. Current polyacrylonitrile (PAN)-based carbon fiber strengths are much below those theoretically possible, and it is of importance to determine if and how they might be improved. An equation is proposed which correlates these factors and gives a first approximation of the strength levels which are reasonably possible. Also, the most likely areas for further carbon fiber research and development are highlighted. Although the thesis presented herein is based on high modulus PAN-based fiber morphology, the same factors, with modification, should be applicable to all carbon fiber strength considerations. GRA

N75-26146# Union Carbide Corp., Tarrytown, N.Y. Corporate Research Lab.
THE PREPARATION AND PROPERTIES OF D2-META-CARBORANE-SILOXANE ELASTOMERS
E. N. Peters, E. Hedaya, J. H. Kawakami, G. T. Kwiatkowski, and R. W. Tulis 17 Jul. 1974 21 p refs
(Contract N00014-72-C-0277; NR Proj. 356-525)
(AD-A003531; CRL-T-795) Avail: NTIS CSCL 07/3

D2-meta-carborane-siloxane elastomers have been reputed to have outstanding thermal properties. The report briefly discusses new approaches to the synthesis of D2-carborane-siloxanes which overcome many of the disadvantages of previous synthetic methods. Thus, linear gum stocks with Tg:s of -40 to -25C and molecular weights up to 250,000 have been prepared. Compounded and cured samples exhibit a linear modulus plateau between approximately -20C and =300C, and outstanding maintenance of mechanical properties after heat aging in air at 315C for 300 hours. The property profile and vulcanization

chemistry of the D2-carborane-siloxane system suggest utility in high performance sealant, gasket, O-ring and coating applications. GRA

N75-26147# National Bureau of Standards, Washington, D.C. Center for Building Technology.
COMPARISON OF THE FIRE PERFORMANCE OF NEOPRENE AND FLAME RETARDANT POLYURETHANE MATTRESSES Final Report
William J. Parker Apr. 1973 46 p refs Sponsored in part by Naval Ship Engineering Center.
(COM-75-10336/6; NBSIR-73-177) Avail: NTIS HC $3.75 CSCL 13L

Full scale fire tests of a neoprene and two different types of flame-retardant polyurethane mattresses were performed in a room sized compartment. The mattresses were tested in two orientations, horizontal and vertical, and with two types of coverings, a fire retardant treated cotton and a high temperature nylon ticking, in addition to the bare mattress insert. In addition to the visual observations, the burning rates, ceiling temperatures, optical density of the smoke, and the toxic gas concentrations were measured. The flame spread index was measured with the radiant panel; and the smoke and toxic gas concentrations were measured in the smoke density chamber. Measurements were performed in the heat release rate calorimeter and the ease of ignition test apparatus. GRA

N75-26148# Lehigh Univ., Bethlehem, Pa. Materials Research Center.
APPLIED RESEARCH AND ENGINEERING ON COATINGS FOR NOISE DAMPING Final Technical Report, 16 Jan. 1973 - 31 Jul. 1974
L. H. Sperling and D. A. Thomas Jan. 1975 61 p refs
(Contract DAAD05-72-C-0175)
(AD-A003852; HEL-TM-1-75) Avail: NTIS CSCL 11/3

The report describes research and development studies on a broad-temperature damping system known as Silent Paint. Materials capable of effective damping over the temperature range of -20C to +60C were developed and optimized. Research was undertaken on both acrylic and poly(vinyl chloride) based damping materials. Damping theory and polymer structure are discussed in relation to performance. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-26149*# Kanner (Leo) Associates, Redwood City, Calif.
FUEL FOR COMPRESSION MICROMOTORS
A. V. Babichev Washington NASA Jul. 1975 2 p Transl. into ENGLISH from Russian Patent no. 247713 (Appl. no. 1085220/23-4, 23 Jun. 1966) 1 p
(Contract NASw-2481)
(NASA-TT-F-16446) Avail: NTIS HC $3.25 CSCL 21D

This fuel for a compression micromotor contains kerosene, aviation oil, castor oil, amyl nitrite, nitrobenzene and ethyl ether. Calcium dioctylphenyldithiophosphate, a rugged, antiwear and antiscoring substance, is added to improve motor starting, to increase its service life by 45-50% and decrease scale formation. AS-6 lubricating oil is added to decrease scale formation. Cyclohexane is added to attain a 20-25% increase in fuel economy. The proposed fuel is used in modeling aircraft, ships, motor vehicles and air-cushion craft. Author

N75-26150*# Kanner (Leo) Associates, Redwood City, Calif.
PROCESS FOR THE PRODUCTION OF HIGHLY PURE METHANOL FUELS WITH CASTOR OIL CONTENT
L. Kapavik and J. Weigner Washington NASA Jul. 1975 3 p Transl. into ENGLISH from Czechoslovak Patent Specification no. 144460 (15 Dec. 1967) 2 p
(Contract NASw-2481)
(NASA-TT-F-16447) Avail: NTIS HC $3.25 CSCL 21D

A more rapid process for preparing technically pure methanol fuels with castor oil content for use in airplane models is described. This new process accelerates the separation of the hydroxystearic acids in the equilibrium concentration and eliminates the fine flakes which clog engine fuel filters as they precipitate out. The formed precipitate is separated out and the solution concentration is adjusted to 20 - 30 volume parts of castor oil in 100 volume parts of fuel. Author

N75-26151# Air Force Systems Command, Wright-Patterson AFB, Ohio.
INFLUENCE OF DISTRIBUTION HETEROGENEITY OF THE CONDENSED PHASE ON THE PERFORMANCE OF SOLID PROPELLANTS
P. Kuentzmann 26 Nov. 1974 25 p refs Transl. into English from Rech. Aerosp. (France), no. 3, 1970 p 145-153
(AD-A004447; FTD-HC-23-2715-74) Avail: NTIS CSCL 21/9

The combustion products of a solid metallized propellant were investigated; they consist of a condensed phase resulting from the combustion of the impurity metal, and are composed of very fine oxide particles. The presence of this condensed phase is found to modify the expansion of the combustion products and to complicate the evaluation of the performance of metallized propellants. The heterogeneity of the distribution of the condensed phase is shown to be accentuated by particle trajectories in the nozzle and to result from their motion in the combustion chamber. M.J.S.

N75-26152# Materials Research Labs., Maribyrnong (Australia).
THEORETICAL PREDICTIONS OF THERMAL EXPLOSIONS. PART 1: A MATHEMATICAL MODEL OF A BOMB IN A FIRE
D. B. Stroud Feb. 1975 21 p refs
(Rept-623-Pt-1) Avail: NTIS HC $3.25

A mathematical model is proposed for describing the flow of heat into a bomb and the subsequent build-up to explosion when the bomb is placed in a large, aviation fuel fire. The model has been used to predict the time to explosion for various bombs and good agreement is obtained with experimental values from the literature. The time to explosion has also been calculated for a bare bomb and for one covered by a thermally protective coating under various fire conditions. Several calculations have been performed to determine the sensitivity of the time to explosion to changes in some of the input parameters. Author

N75-26153# Materials Research Labs., Maribyrnong (Australia).
DEVELOPMENT OF FUZE DA MK AN/2. PART 1: MECHANICAL DESIGN AND TESTING
R. C. Czigledy and J. R. Bentley Dec. 1974 29 p refs
(MRL-TN-355-Pt-1) Avail: NTIS HC $3.75

The fuze AN/2 was developed from the fuze 230 and the major design change involved an extension of the length and mass of the fuze 230 magazine. The structural integrity of the fuze is demonstrated and the problems associated with the long train of CE pellets necessary to fill the magazine are investigated. Performance is shown to be satisfactory. Author

N75-26154# Materials Research Labs., Maribyrnong (Australia).
THE STAB SENSITISING ACTION OF TETRAZENE
R. Bird Jan. 1975 13 p refs
(MRL-TN-362) Avail: NTIS HC $3.25

The stab sensitivities (detonation) of a number of primary explosives were studied. Results show a direct relationship between high stab sensitivity and a low temperature of ignition. Tetrazene is shown to have a high stab sensitivity. Author

N75-26155# Arbeitsgruppe fuer Ballistische Forschung, Weil am Rhein (West Germany).
MUZZLE FIRE INVESTIGATIONS USING A POWDER WITHOUT FIRE ATTENUATING COMPOUNDS [MUENDUNGSFEUERUNTERSUCHUNGEN BEI VERWENDUNG EINES PULVERS OHNE FEUERDAEMPFUNGSZUSATZ]
G. Klingenberg Aug. 1974 39 p refs In GERMAN
(ABF-3/74) Avail: NTIS HC $3.75

The light phenomena in the muzzle fire of an infantry rifle firing cartridges without fire attenuating additives were spectroscopically investigated and compared with investigations of

propellants with fire attenuating admixtures of KNO3, Na2SO4, and CaCO3. ESRO

N75-26156# Lockheed Propulsion Co., Redlands, Calif.
COMBUSTION OF NITRAMINE PROPELLANTS
Norman S. Cohen and Channon F. Price 1975 8 p refs
(Contract F44620-74-C-0031; AF Proj. 9711)
(AD-A004815; AFOSR-75-0017TR) Avail: NTIS CSCL 21/2

The composite solid propellant combustion model of Beckstead, Derr and Price is modified to describe the combustion of Nitramine propellants. Modifications are based upon experimental observations of the combustion characteristics of hydrocarbon binder propellants containing cyclotetramethylenetetranitramine (HMX). GRA

N75-26157# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
SOLID PROPELLANT ADMITTANCE MEASUREMENTS BY THE DRIVEN TUBE METHOD Interim Report, Jun. 1973 - Jul. 1974
T. Zinn, R. Daniel, A. Bell, and M. Salikuddin Aug. 1974 75 p refs
(Grant AF-AFOSR-2571-73; AF Proj. 9711)
(AD-A004537; AFOSR-75-0019TR) Avail: NTIS CSCL 21/2

A driven tube burner has been developed and tested under both cold and hot flow conditions. The cold flow tests provided a check on the proper operation of the facility and the data reduction scheme. Temperature measurements of the gas inside the burner tube, taken during the burning of a solid propellant sample, indicate the presence of axial and radial temperature gradients in the burner. The effect of these gradients upon the quality of the measured admittance data is under investigation. Preliminary hot tests conducted to date confirmed the proper operation of the facility and its ability to provide good pressure amplitude and phase data. These data are now being used to compute the desired solid propellant admittances. In the analytical phase of this program, a most promising analytical technique for the determination of both the admittance and entropy perturbation at the propellant burning surface, from dynamic pressure and steady temperature measurements, has been developed. Also, the effect of the steady state temperature gradients upon the wave structure inside the burner tube has been investigated analytically. GRA

N75-26158# Exxon Research and Engineering Co., Linden, N.J.
LUBRICITY OF JP-5 AND DIESEL FUELS Final Technical Report, Jun. 1973 - Oct. 1974
Arthur R. Garabrant Dec. 1974 92 p refs
(Contract DAAD05-73-C-0563)
(AD-A004038; GRU.1PD.74) Avail: NTIS CSCL 11/8

The U.S. Army is considering the replacement of diesel fuels by aviation turbine fuels, and is pursuing development of a universal middle distillate fuel in which certain lubricity parameters are needed. The wear and friction characteristics of eleven selected aviation turbine and diesel fuels were evaluated with the aid of the Exxon Research and Engineering Company's Ball-On-Cylinder-Machine. Limited additional testing of some of the fuels was done with the aid of the Vicker Vane Pump. Fuel nitrogen and sulfur levels, as well as back end volatilities and viscosities, are factors in wear phenomena. Relative humidity of the ambient air, or water content of the fuels, has a significant effect upon the fuels lubricity properties. Wear phenomena observed with the Ball-On-Cylinder-Machine and the Vicker Vane Pump are correlatable. GRA

N75-26159# Atlantic Research Corp., Alexandria, Va. Kinetics and Combustion Group.
STUDIES OF THE IGNITION AND COMBUSTION OF BORON PARTICLES FOR AIR-AUGMENTED ROCKET APPLICATIONS Interim Report, 1 Jul. 1971 - 31 Dec. 1973
Merrill K. King and Andrej Macek Oct. 1974 106 p refs
(Contract F44620-71-C-0124; AF Proj. 9711)
(AD-A003731; TR-PL-10433; AFOSR-75-0043TR) Avail: NTIS CSCL 21/9

The objective of the present work has been to characterize the nature of the primary exhaust from fuel-rich motors containing boron, and to study its ignition and combustion characteristics, especially as compared to the known information for pure boron. Section II of the present report describes (a) the rocket-motor firing program in which the condensed exhaust (CE) from two different composite ammonium perchlorate propellants was collected, and (b) the results of thermodynamic computations for these formulations. Sections III and IV contain the results of the physical (microscopy, density measurement) and chemical analyses of the CE. Section V deals with combustion of the CE. Finally, Sections VI and VII report the results of modeling studies describing the ignition of single boron particles in hot gas streams and propagation of flames in boron-oxygen-nitrogen dust clouds. GRA

N75-26160# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETONATION
K. I. Schelkin 19 Dec. 1974 40 p Transl. into ENGLISH of the book "Detonatsiya" USSR, 1968 p 1-32
(AD-A004436; FTD-HC-23-2112-74) Avail: NTIS CSCL 19/4

Photographic recording of flame propagation in tubes containing mixtures of combustible gases and air and oxygen to determine the flame speed is reviewed along with the theory of detonation based on shock wave theory. Combustion in a rarefaction wave, pulsating and spin detonation, in explosives, and detonation in gasoline engines are discussed. J.M.S.

N75-26161# Denver Research Inst., Colo. Labs for Applied Mechanics.
SPECTRAL DISTRIBUTION OF DIFFERENT REGIONS IN ILLUMINATING FLARE FLAMES 2 Final Report, 26 Jun. 1972 - 30 Apr. 1974
Robert M. Blunt 10 Jan. 1975 93 p refs
(Contract N000164-72-C-0605)
(AD-A004618; DRI-4793-7404-F; NAD-CR-RDTR-292) Avail: NTIS CSCL 19/1

Stoichiometric and fuel rich illuminating flare compositions containing magnesium, sodium nitrate and 4.5% epoxy binder were burned at ambient pressures of 630/150/30 torr in air. Grating spectra with a reciprocal dispersion of about 11A/mm were obtained with an astigmatic spectrograph by focussing an image of the flame on the slit. The resultant spectrogram was analyzed to obtain the relative spectral radiance of the flame as a function of height along the central axis of the flare candle. It was found that changes do occur in the spectral distribution with increasing height above the candle. GRA

N75-26162# United States-Israel Binational Science Foundation.
THERMODYNAMIC AND THERMOPHYSICAL PROPERTIES OF COMBUSTION PRODUCTS. VOLUME 2: OXYGEN-BASED PROPELLANTS
V. E. Alemasov, A. F. Dregalin, A. P. Tishin, V. A. Khudyakov, and V. N. Kostin 1975 501 p refs Transl. into ENGLISH of the book "Termodinamicheskie i teplofizicheskie svoistva produktov sgoraniya, topliva na osnove kisloroda" Moscow, 1972 Sponsored in part by NSF
(TT-74-50032) Avail: NTIS HC $12.25 CSCL 21I

The report is the first of a series of volumes which, in the form of tables and charts, give the thermodynamic and thermophysical properties of the combustion products of various composite propellants, with oxygen as the oxidizer. All the data reported were obtained by the authors by calculation, using the original methods and programs described in Volume 1. GRA

N75-26163# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPECIFIC IMPULSE LOSSES OF METALLIZED SOLID PROPELLANTS
P. Kuentzmann 26 Nov. 1974 37 p refs Transl. into ENGLISH from Entropie (Paris), no. 53, Sep./Oct. 1973 p 38-48
(AD-A004354; FTD-HC-23-2717-74) Avail: NTIS CSCL 21/9

In the combustion products of a metallized propellant, the condensed phase is composed of microscopic particles suspended in the gaseous phase. This aspect of the flow is manifested in a specific impulse loss that may reach 10% of the theoretical value given by thermodynamic calculation. The problem of specific impulse losses is partly related to that of relaxed flows, from the two-phase standpoint, of a suspension. An analytical formula

is given here permitting the estimation of the specific impulse loss due to kinetic and thermal phase shifts. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-26164# Joint Publications Research Service, Arlington, Va.
VIBROACOUSTIC PROCESSES IN MACHINE AND COUPLED DEVICES
M. D. Genkin, ed. 4 Jun. 1975 100 p refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974
(JPRS-64910) Avail: NTIS HC $4.75

The problems of vibrations in toothed transmission and the distribution of the vibrations along the transmission components bf the machine and mechanisms are examined. A discussion of the following is included: gear wheels with a spring-mounted rim; flexible rim fastening; a toothed rim on a flexible base; a vibration damping support with an electromechanical control system; a vibration damper with electromechanical feedback; piezoelectric linear accelerometers; electronically tunable analyzers and filters; and, recursive digital filtration mechanisms. For individual titles, see N75-26165 through N75-26172.

N75-26165 Joint Publications Research Service, Arlington, Va.
DYNAMICS OF GEAR WHEELS WITH A SPRING MOUNTED RIM c37
M. D. Genkin, V. K. Grinkevich, and V. I. Poryadkov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 1-5 Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 33-36 (For availability see N75-26164 17-31)

The need for insulating engaged gears from vibrations of shafts and body structures promoted a design for gear wheels with an elastically fastened rim. The design effectiveness results from two causes: the masses and moments of inertia of parts participating directly in producing dynamic loads in gearing decrease; the reduced dynamic load is transmitted to other parts of the transmission through an elastic component, causing the load effect to decrease in proportion to the elasticity of the connection. A transmission consisting of two gear wheels with spring-mounted rims resting on elastic bearings is discussed and is represented as a dynamic system having 12 degrees of freedom. Author

N75-26166 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL RESEARCH ON THE EFFECTIVENESS OF FLEXIBLE RIM FASTENING c37
M. D. Genkin, V. K. Grinkevich, and V. I. Poryadkov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 6-11 ref Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 37-41 (For availability see N75-26164 17-31)

The problem of insulating gearing from vibrations of shafts and body structures is discussed. A gear wheel and pinion was designed and built for the purpose of experimentally testing the effectiveness of flexible fastening of a gear wheel rim on an extremely soft, rubber base. The gearing with a flexible rim consists of two wheels on separate shafts, each of which includes a toothed ring, rim, bolt, vulcanized rubber, hub, and prison bolt plus transmitter. The rubber is fitted between the inner and outer surfaces of the rim and hub, and is joined to the metal surface by vulcanization. The gear wheels were tested on a special stand. Wheels employing each of the two variants of rim fastening were tested for manufacturing precision with respect to wobble. Author

N75-26167 Joint Publications Research Service, Arlington, Va.
VIBRATIONS OF A TOOTHED RIM ON A FLEXIBLE BASE c37
M. D. Genkin, V. K. Grinkevich, and V. I. Poryadkov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 12-20 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 42-48 (For availability see N75-26164 17-31)

A gearing with flexible rims was developed and vibrations of the rim viewed as a circular beam on a flexible base were examined. Radial, torsional, and flexural vibrations were studied and formulas were established for deformation, displacement, vibrational frequencies, and rigidity. L.B.

N75-26168 Joint Publications Research Service, Arlington, Va.
A VIBRATION DAMPING SUPPORT WITH AN ELECTROMECHANICAL CONTROL SYSTEM c37
V. G. Yelezov *In its* Vibroacoustic processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 21-32 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 66-75 (For availability see N75-26164 17-31)

A vibration damping support is examined in three working modes: the rated rigidity mode (the electromechanical control system is turned on); the low support rigidity mode (achieved through partial or complete compensation of the weight of the object being damped by electromagnetic attraction); and, the controlled low rigidity mode (achieved by partial or complete magnetic suspension). A device consisting of a shock absorber and an electromagnet controlling the degree of absorber deformation is treated as a vibration damper with adjustable rigidity. The possible structural variants of installing such a device are presented. The possibility of achieving low (damper) rigidity and maintaining static (damped object) stability is examined. Preliminary computations for a damper with two equal-frequency shock absorbers and an electromagnet in the saturated mode are included. L.B.

N75-26169 Joint Publications Research Service, Arlington, Va.
SELECTION OF OPTIMUM PARAMETERS OF AN ACTIVE VIBRATION DAMPER WITH ELECTROMECHANICAL FEEDBACK WITH RESPECT TO RELATIVE DISPLACEMENT AND TOTAL FORCE c37
M. D. Genkin, V. G. Yelezov, R. B. Statnikov, and V. V. Yablonskiy *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 1-5 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 76-82 (For availability see N75-26164 17-31)

A system for active vibration damping of a mechanical object with wideband electromechanical feedback is examined with respect to relative displacement and total force. This system is designed to improve the vibration damping of suspensions having relatively high static rigidity. Such improvement is achieved by imposing an additional force on the object being insulated. This force is created by an electromechanical vibrator controlled by a signal from a vibration pickup. The vibration source and the object being insulated can have random mechanical resistance on the part of the flexible element. The system can also be used to protect the vibration source from vibration of the foundation. Author

N75-26170 Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF THE MEASURING PROPERTIES OF LINEAR ACCELEROMETERS c35
V. S. Golubev *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 42-63 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 83-98 (For availability see N75-26164 17-31)

The vibrational measuring properties of piezoelectric linear accelerometers are assessed. The ideal linear accelerometer is viewed as a noninertial device, producing an electric signal proportional to the projection of the vectors of absolute acceleration, and the intensity of the gravitational field onto the working axis of the accelerometer at the point of measurement. The work of an accelerometer and another measuring device

having moving systems of inertial masses and elastically suspended inertial elements are examined. Author

N75-26171 Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF ELECTRONICALLY TUNABLE ANALYZERS AND FILTERS **c33**
M. D. Genkin, V. S. Golubev, and A. I. Orlov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 64-85 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 107-123 (For availability see N75-26164 17-31)

Some structural variants of electronically tunable analyzers and filters are examined which operate in accordance with a set program in response to transducers that prescribe a frequency proportional to the part rotation frequency. The need for standardizing the transfer function with respect to frequency and module is discussed. Wideband multipliers and operational amplifiers with low noise and drift are viewed as essential in the construction of tunable filters and generators working in the acoustic frequency range. Author

N75-26172 Joint Publications Research Service, Arlington, Va.
RECURSIVE DIGITAL FILTRATION AND SPECTRUM ANALYSIS **c35**
A. Ya. Kuno and M. D. Genkin *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 86-100 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 124-135 (For availability see N75-26164 17-31)

The problems of building recursive digital filters and recursive analyzers is examined. The structuring of digital filters out of electronic computers using the appropriate programs is discussed and performed. An analog-digital converter is used to convert a continuous signal into a sequence of digits. The advantages and shortcomings of digital filters compared with analog filters are examined. The importance of the Laplace transformation in calculations is discussed and methods for recursively achieving transfer functions are examined. L.B.

N75-26173# Joint Publications Research Service, Arlington, Va.
GYROSCOPIC SYSTEMS AND INSTRUMENTS OF PRECISION MECHANICS
5 Jun. 1975 104 p refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, 1974; no. 1, no. 2, no. 3, 1975 90 p
(JPRS-64926) Avail: NTIS HC $5.25

Drift analyses and compensation techniques for gyrostabilized instrumentation systems are reported. For individual titles, see N75-26174 through N75-26191.

N75-26174 Joint Publications Research Service, Arlington, Va.
KINEMATIC EQUATIONS OF ERRORS OF CELESTIAL NAVIGATION SYSTEMS **c04**
V. A. Karakashev and V. A. Udalov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 1-6 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 67-71 (For availability see N75-26173 17-31)

The equations of errors of celestial navigation systems in determining the coordinates of a moving object and in the simulation of the resulting trajectory as a function of the errors of the analogs that simulate the horizon and earth coordinate systems and the coordinate system connected to celestial bodies, are presented in this article. Author

N75-26175 Joint Publications Research Service, Arlington, Va.
THE ERROR OF A TWO-ROTOR PENDULUM GYROCOMPASS DUE TO ASYMMETRIC ROLLING **c35**
A. E. Potemkin *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 7-11 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 71-75 (For availability see N75-26173 17-31)

It is shown that asymmetric rolling of a gyrocompass causes considerable additional error, which increases or decreases the basic rolling error. Calculation equations on the error of a gyrocompass due to asymmetric rolling are presented. The result of the calculation is compared with experimental results. Author

N75-26176 Joint Publications Research Service, Arlington, Va.
ON THE DAMPING OF LINEAR ROTOR OSCILLATIONS IN SUPERCONDUCTING SUSPENSION **c35**
B. A. Ryabov, A. I. Chernomorskiy, and K. B. Yakovlev *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 12-15 Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 76-79 (For availability see N75-26173 17-31)

Analytical and graphic relations that provide the required degree of attenuation of linear oscillations of the rotor of a cryogenic gyroscope are presented. Author

N75-26177 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF DRIFT MOMENTS ACTING UPON DAMPING ROTOR IN ELECTROSTATIC SUSPENSION **c35**
Yu. M. Osipov, Ye. M. Pevzner, and A. N. Balyasnikova *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 16-21 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 79-83 (For availability see N75-26173 17-31)

Drift moments acting upon the rotor in an electrostatic suspension, on the assumption that the rotor is somewhat different from spherical shape, are analyzed. Equations are derived for evaluating the maximum moments and for qualitative determination of the action of each distorting factor on the magnitude of the drift moment. Author

N75-26178 Joint Publications Research Service, Arlington, Va.
ON THE STABILITY OF A CYLINDRICAL HYDRODYNAMIC SUSPENSION IN APPLICATION TO INTEGRATING ACCELEROMETERS **c35**
K. P. Andreychenko and O. G. Andreychenko *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 22-26 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 84-87 (For availability see N75-26173 17-31)

The differential equations of motion of the float relative to the chamber in a cylindrical hydrodynamic suspension are derived. An analysis of these equations for stability on the basis of the Gurvits criterion is presented. Author

N75-26179 Joint Publications Research Service, Arlington, Va.
KALMAN FILTER WITH BIAS **c35**
N. N. Korobov and A. A. Dolgiy *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 27-32 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 45-50 (For availability see N75-26173 17-31)

The application of the probability functional of the Andreyev quality, which permits the generalization of the Kalman's result to the case of biased estimation, is estimated. Author

N75-26180 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF ERRORS OF SELF-CONTAINED INERTIAL NAVIGATION SYSTEMS, ATTRIBUTED TO RANDOM PERTURBATIONS OF ANALOG OF INERTIAL COORDINATE SYSTEM **c35**
V. A. Karakashev and S. G. Romanenko *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 33-38 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 75-80 (For availability see N75-26173 17-31)

The results of analysis of the errors of horizon-analytical (semianalytical) and space-mechanical (geometric) inertial navigation systems (INS), produced by random perturbations of the analogs of the inertial coordinate system, are presented in this article. Author

N75-26181 Joint Publications Research Service, Arlington, Va.
SUBOPTIMUM ALGORITHMS OF FILTRATION IN TARGET POSITION CORRECTION SYSTEMS **c35**
A. N. Kayander, B. S. Rivkin, and G. V. Tyumeneva *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 39-45 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 80-85 (For

availability see N75-26173 17-31)

A complex system for determining the location of a target, including a ship coordinate computer, based on a relative log, hyperbolic radionavigation system and processing system, representing a Kalman filter, was examined. The feasibility in such a system of replacing the Kalman filter with some suboptimum filter which provides nearly optimum precision characteristics and makes it possible to reduce the volume of computations during the realization of the optimum filter by computer, is demonstrated. Author

N75-26182 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE FEASIBILITY OF REDUCING ONE OF THE ERRORS OF SELF-CONTAINED AZIMUTH FINDING SYSTEMS OF GYROSTABILIZED PLATFORM (GSP) c35
Z. G. Zost *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 46-52 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 85-91 (For availability see N75-26173 17-31)

The basic errors of the azimuth finding system of the gyroplatform of a triaxial gyrostabilizer are examined. It is shown that the known methods of reducing these errors do not permit a substantial reduction of the azimuth determination error of GSP, caused by extraneous moments, acting on the stabilization axis of a triaxial gyrostabilizer. A means of reducing this error is suggested and analyzed. Author

N75-26183 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL ANALYSIS OF THE INFLUENCE OF INTERNAL PERTURBATIONS ON PRECISION OF FLOAT GYROSCOPIC INSTRUMENTS c35
V. Yu. Chizhikov, Ye. A. Izmaylov, and B. P. Tsitsin *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 53-59 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 92-97 (For availability see N75-26173 17-31)

The components of the summary extraneous moment, acting on the output axis of a float gyroscopic instrument, are examined. Experimental results for several instruments of the type supplementary drift angle (SDA), on the basis of which it is possible to estimate the perturbing moments, are presented. Author

N75-26184 Joint Publications Research Service, Arlington, Va.
UNIAXIAL GYROSCOPIC STABILIZER WITH INSTRUMENTAL DRIFT COMPENSATION CIRCUIT c35
Yu. B. Vlasov and O. M. Filonov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 60-64 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 67-71 (For availability see N75-26173 17-31)

One circuit for compensating instrumental drift of an astatic uniaxial gyrostabilizer (UGS), incorporating a rotor vibration gyroscope as an instrument for measuring angular drift rates, is analyzed in this article. It is shown that drift may be reduced substantially. Recommendations are made concerning methods of insuring the stability of the system. Author

N75-26185 Joint Publications Research Service, Arlington, Va.
HIGH-SENSITIVITY GYROSCOPE DRIFT METER c35
R. I. Vcherashniy and Yu. A. Borisov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 65-69 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 71-74 (For availability see N75-26173 17-31)

A highly sensitive sensor for measuring small angular displacements, based on the anisotropy of ferromagnetic resonance in thin magnetic films, is examined in this article. Author

N75-26186 Joint Publications Research Service, Arlington, Va.
AUTOMATIC PHOTOELECTRIC VERTICAL SENSOR c35
A. M. Zhilkin, S. A. Khodos, and A. B. Shereshev *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 70-74 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 75-78 (For availability see N75-26173 17-31)

The block diagram of an automatic photoelectric sensor is presented that provides a precision of 1.5 angular second when determining angular deviation from the vertical with a time constant of the order of 0.01 s. Author

N75-26187 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF BEARING OF CLOCK BALANCE WHEEL ON ELASTIC SUSPENSION c35
Z. M. Akselrod *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 75-81 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 79-84 (For availability see N75-26173 17-31)

Equations for calculating the parameters of an elastic shock absorber and for estimating the shock absorbing efficiency of the staff journals of a clock balance wheel are derived. Author

N75-26188 Joint Publications Research Service, Arlington, Va.
SPRING-DRIVEN CONSTANT-TORQUE MOTOR c37
V. K. Yankeliovich *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 82-88 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 84-89 (For availability see N75-26173 17-31)

A method of calculation is reported for a spring driven constant torque motor with a coil spring, which for a given torque, RPM and required cyclic strength determines the parameters of the motor in consideration of the tension of the spring on the drum and change of radius of curvature of the spring along its length. Author

N75-26189 Joint Publications Research Service, Arlington, Va.
ON ONE CONDITION OF MINIMIZATION OF DRIFT MOMENTS OF ELECTROSTATIC GYROSCOPE c35
V. V. Timofeyev *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 89-96 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 3, Mar. 1975 p 66-70 (For availability see N75-26173 17-31)

Rotor perturbations, caused by the electrostatic suspension, are examined in this article on the basis of the concept of the density of electrical forces that occur during the deformation of an arbitrarily oriented sensor. The relations between the parameters of the suspension that permit a substantial reduction of the perturbations of the rotor from the suspension, are presented. Author

N75-26190 Joint Publications Research Service, Arlington, Va.
DOUBLE INTEGRATING VIBRATION ACCELEROMETER WITH OPTICAL DEFLECTION GONIOMETER c35
N. A. Pykhov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 97-100 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 3, Mar. 1975 p 71-73 (For availability see N75-26173 17-31)

The functional design of an accelerometer, representing an asynchronous micromotor operating in the self-exciting mode, is examined in this article. Author

N75-26191 Joint Publications Research Service, Arlington, Va.
ON THE MOTION OF A GYROSCOPE DURING ROTATION OF ITS CARDAN SUSPENSION c35
V. F. Avdeyev, Ye. Ye. Belyanin, and L. M. Ryzhkov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 101-104 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 3, Mar. 1975 p 74-76 (For availability see N75-26173 17-31)

The problem of setting the axis of a gyroscope in the prescribed position by rotating the cardan suspension is examined. It is shown that the setting time may be shortened by using a gyroscope during the rotor spin-up time. Author

N75-26192*# Boeing Aerospace Co., Seattle, Wash.
LIGHTWEIGHT VACUUM JACKET FOR CRYOGENIC INSULATION, VOLUME 1 Final Report
D. L. Barclay, J. E. Bell, E. W. Brogren, and J. W. Straayer Apr. 1975 271 p refs
(Contract NAS3-15848)
(NASA-CR-134759; D180-18476-1) Avail: NTIS HC $8.50 CSCL 20L

The feasibility of producing a lightweight vacuum jacket using state-of-the-art technology and materials was examined. Design and analytical studies were made on a full-scale, orbital maneuvering system fuel tank. Preliminary design details were

made for the tank assembly, including an optimized vacuum jacket and multilayer insulation system. A half-scale LH2 test model was designed and fabricated, and a force/stiffness proof test was conducted on the vacuum jacket. A vacuum leak rate of .000001 atmosphere ml of helium per second was measured, approximately 1500 hours of vacuum pressure were sustained, and 29 vacuum-pressure cycles were experienced prior to failure. Author

N75-26193# Oxford Univ. (England). Dept. of Engineering Science.
IDENTIFICATION AND CONTROL OF A DISTILLATION COLUMN
O. L. R. Jacobs and D. A. J. Dyer [1975] 66 p refs
(Grant SRC-B/SR/90732)
(OUEL-1115/75) Avail: NTIS HC $4.25

The practicality of using recently developed identification algorithms for designing feedback controllers for real industrial processes, notably column distillation, was investigated. The most significant column variables were determined and the control variables were chosen. Experiments leading to a mathematical model of the relationship between side stream flow rate and the concentration of the trace component were identified. Feedback control laws were implemented and developed based on the minimal variance controller for the identified mathematical model. ESRO

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N75-26194* National Aeronautics and Space Administration. Pasadena Office, Calif.
VEHICLE LOCATING SYSTEM UTILIZING AM BROADCASTING STATION CARRIERS Patent
George R. Hansen, Jr., inventor (to NASA) (JPL) Issued 10 Jun. 1975 15 p Filed 21 May 1973 Supersedes N73-26144 (11 - 17, p 1997) Sponsored by NASA
(NASA-Case-NPO-13217-1; US-Patent-3,889,264; US-Patent-Appl-SN-362145; US-Patent-Class-343-105R; US-Patent-Class-343-112D) Avail: US Patent Office CSCL 17B

A vehicle locating system is disclosed which uses the carrier signals of unsynchronized commercial AM broadcasting stations to form hyperbolic isophase grid lines. Each vehicle is equipped with a three-channel receiver, and each channel is tuned to a different one of three spaced apart stations, in order to provide to a central station, information of motion from a known position by counting isophase lines crossed. A stationary receiver similarly counts isophase lines, which cross some fixed location due to drift in the transmission of the unsynchronized stations, and provide drift information which is subtracted from the vehicle motion information. Official Gazette of the U.S. Patent Office

N75-26195* National Aeronautics and Space Administration. Pasadena Office, Calif.
ASYNCHRONOUS, MULTIPLEXING, SINGLE LINE TRANSMISSION AND RECOVERY DATA SYSTEM Patent
Tage O. Anderson, inventor (to NASA) (JPL) Issued 10 Jun. 1975 12 p Filed 27 Mar. 1974 Supersedes N74-19806 (12-11; p 1263) Sponsored by NASA
(NASA-Case-NPO-13321-1; US-Patent-3,889,064; US-Patent-Appl-SN-455163; US-Patent-Class-179-15BS; US-Patent-Class-325-4; US-Patent-Class-178-69.5R) Avail: US Patent Office CSCL 17B

Asynchronously multiplexed sample data sub-systems employ transmission over a single line to a remote synchronizer and demultiplexer. At the remote snychronizer, the data are recovered by synchronizing signals derived from the data itself. A sub-system, or satellite location, supplies continuously sampled binary data along with a satellite identification and synchronizing sequence as a satellite message frame. This information is supplied bit-serially, to a multiplexer junction. The multiplexed satellite information is delivered asynchronously onto a single line transmission channel with other like bit serial satellite message information from other satellite monitoring sites. Such satellite information is transmitted to a central collection and analysis site where it is demultiplexed according to the words and bits that make up a satellite message frame.
Official Gazette of the U.S. Patent Office

N75-26196 New York Univ., N.Y.
TRAVELLING PLANETARY SCALE WAVES IN THE IONOSPHERE Ph.D. Thesis
Donald J. Cavalieri 1974 58 p
Avail: Univ. Microfilms Order No. 75-12461

From an analysis of variations in the received daytime phase of long distance, cesium-controlled very low frequency data measured over several longitudinal transmission paths, travelling planetary scale waves were shown to exist at about 70 km for the 1970/71 winter. The movement of these waves at 70 km is compared with the travelling planetary-scale waves in the lower stratosphere as detected by the satellite infrared spectrometer instrument on Nimbus 4 weather satellite during the same period. The VLF-phase data are used to study the major mid-winter warming which occurred during the 1970/71 winter. The results of a power spectral and cross-spectral analysis of the data are also presented and discussed. Dissert. Abstr.

N75-26197 Polish Academy of Sciences, Warsaw.
INFLUENCE OF THE SPEECH RATE ON THE COURSE OF POLISH VOWEL FORMANTS [WPLYW TEMPA MOWY NA PRZEBIEGI FORMANTOW SAMOGLOSEK POLSKICH]
Piotra Lobacz 5 Nov. 1974 113 p refs In POLISH
Avail: Issuing Activity

A description of formant processes in the sphere of vocalization, the length and rate of unsteady vowels, and changes in the frequency of formants which depend on the context of the consonant and the tempo. Other topics discussed include synthetic speech, speech recognition, acoustical descriptions, duration of speech, and the usage of computer programs in speech analysis. Transl. by M.J.S.

N75-26198*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DIGITAL SIMULATION OF A COMMUNICATION LINK FOR PIONEER SATURN URANUS ATMOSPHERIC ENTRY PROBE, PART 1
C. A. Hinrichs Feb. 1975 80 p refs
(Contract NAS2-7935)
(NASA-CR-137640-Pt-1) Avail: NTIS HC $4.75 CSCL 17B

A digital simulation study is presented for a candidate modulator/demodulator design in an atmospheric scintillation environment with Doppler, Doppler rate, and signal attenuation typical of the conditions of an outer planet atmospheric probe. The simulation results indicate that the mean channel error rate with and without scintillation are similar to theoretical characterizations of the link. The simulation gives information for calculating other channel statistics and generates a quantized symbol stream on magnetic tape from which error correction decoding is analyzed. Results from the magnetic tape data analyses are also included. The receiver and bit synchronizer are modeled in the simulation at the level of hardware component parameters rather than at the loop equation level and individual hardware parameters are identified. The atmospheric scintillation amplitude and phase are modeled independently. Normal and log normal amplitude processes are studied. In each case the scintillations are low pass filtered. The receiver performance is given for a range of signal to noise ratios with and without the effects of scintillation. The performance is reviewed for critical reciever parameter variations. Author

N75-26199*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DIGITAL SIMULATION OF A COMMUNICATION LINK FOR PIONEER SATURN URANUS ATMOSPHERIC ENTRY PROBE, PART 2
C. A. Hinrichs Feb. 1975 256 p refs
(Contract NAS2-7935)
(NASA-CR-137640-Pt-2) Avail: NTIS HC $8.50 CSCL 17B

For abstract, see N75-26198.

N75-26200*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPLICATION OF MOBILE DIGITAL COMMUNICATIONS IN LAW ENFORCEMENT, AN INTRODUCTORY PLANNING GUIDE
R. L. Sohn, J. E. Abraham, W. G. Leflang, R. D. Kennedy, J. H. Wilson, and R. M. Gurfield 15 May 1975 68 p refs
(Contract NAS7-100)
(NASA-CR-142987; JPL-SP-43-6-Rev-1) Avail: NTIS HC $4.25 CSCL 17B

A set of planning guidelines for the application of digital communications techniques to law enforcement use is presented. Some essential characteristics of digital techniques and their applications are outlined, as are some principles of system analysis, evaluation, and planning. Requirements analysis, system concept design, implementation planning, and performance and cost modeling are described and demonstrated with respect to this application problem. Information on law enforcement digital communications systems and equipment and a list of vendor sources are given in appendices. Author

N75-26201# Communications Research Centre, Ottawa (Ontario). Technology and Systems Branch.
A QUANTITATIVE APPROACH TO INTERPERSONAL COMMUNICATION
P. E. Allard, W. C. Treurniet, R. W. McCaughern, and J. G. Craig Apr. 1975 17 p refs
(CRC-1271) Avail: NTIS HC $3.25

A mathematical model of human dyadic communication is described. The axiom underlying the model assumes a mutual interdependency of behavioral and psychophysiological parameters describing the members of the dyad. Subsequent development of the model suggests that degree of synchrony, a measurable quantity, is directly related to the transfer of information. A short review of relevant social psychological literature is included as well as a discussion of the applicability of the model to teleconferencing research. Author

N75-26202*# New Mexico State Univ., Las Cruces. Physical Science Lab.
ANTENNA AND RADOME LOSS MEASUREMENTS FOR MFMR AND PMIS WITH APPENDIX ON MFMR/PMIS COMPUTER PROGRAMS
K. R. Carver and Wm. K. Cooper May 1975 199 p refs
(Contract NAS9-95451)
(NASA-CR-141871; PA-00817) Avail: NTIS HC $7.00 CSCL 17B

The NMSU/PSL radiometer antenna calibration facility is described, and the antenna and radome loss measurements made on the passive microwave imaging system and the multifrequency microwave radiometer are summarized. Antenna/radome data reduction techniques, estimation of sky brightness temperatures, and bucket performance tests are presented along with radiometer computer programs. M.J.S.

N75-26203*# Philco-Ford Corp., Palo Alto, Calif. Western Development Labs. Div.
SEQUENTIAL COLOR VIDEO TO PARALLEL COLOR VIDEO CONVERTER Final Report
20 Feb. 1975 84 p
(Contract NAS9-13781)
(NASA-CR-141891; WDL-TR5759) Avail: NTIS HC $4.75 CSCL 17B

The engineering design, development, breadboard fabrication, test, and delivery of a breadboard field sequential color video to parallel color video converter is described. The converter was designed for use onboard a manned space vehicle to eliminate a flickering TV display picture and to reduce the weight and bulk of previous ground conversion systems. Author

N75-26204# Joint Publications Research Service, Arlington, Va.
LEGAL ASPECTS OF SPACE COMMUNICATIONS
A. S. Piradov, ed. 9 Jul. 1975 25 p refs Transl. into ENGLISH from the book "Mezhdunarodnoye Kosmicheskoye Pravo" Moscow, Izdatelstvo Mezhdunarodnyye Otnosheniya, 1974 p 164-185, 225-233
(JPRS-65173) Avail: NTIS HC $3.25

Data, on the regulation of various aspects of space activities and the international cooperation of the U.S.S.R. in the study and use of space are reported. Author

N75-26205# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Microwave Physics Lab.
AN ABLATION TECHNIQUE FOR ENHANCING REENTRY ANTENNA PERFORMANCE: FLIGHT TEST RESULTS
Dallas T. Hayes, Sheldon B. Herskovitz, John F. Lennon, and J. Leon Poirier 14 Nov. 1974 80 p refs Backup document for AIAA Synoptic, "Flight Test Comparison of Two Electron Attachment Techniques", scheduled for publication in the Journal of Spacecraft and Rockets in Sep. 1975
(AF Proj. 2153)
(AFCRL-TR-74-0572; AFCRL-PSRP-611) Avail: NTIS HC $4.75

Techniques for modifying reentry plasmas were investigated to develop alternative solutions to problems relating to signal transmission in the presence of ionization. The program included laboratory tests and a series of reentry flight experiments. The flight test of one successful technique, Teflon ablation, a passive approach that requires no internal support system is described. A reentry vehicle fitted with a Teflon-coated nosecap was instrumented to measure antenna impedance mismatch, interantenna coupling, signal attenuation, and charged-particle density. The probe data showed that the local boundary layer electron density decreased by as much as a factor of 200. The Teflon coating effected a 25-db decrease in S band signal attenuation. High power antenna breakdown was modified by the presence of the ablation products. Details of vehicle design, flight dynamics, and ablation are presented. The results of the Teflon ablation technique are contrasted with those of a successful liquid-injection technique that was tested on a previous flight. Author

N75-26206*# National Aeronautics and Space Administration. Pasadena Office, Calif.
CHARGE-COUPLED DEVICE DATA PROCESSOR FOR AN AIRBORNE IMAGING RADAR SYSTEM Patent Application
Wayne E. Arens, inventor (to NASA) (JPL) Filed 23 Jun. 1975 38 p
(Contract NAS7-100)
(NASA-Case-NPO-13587-1; US-Patent-Appl-SN-589119) Avail: NTIS HC $3.75 CSCL 17I

The processing is described of raw analog echo data from a side-looking synthetic aperture radar receiver into images on board an airborne radar platform. The data were processed by using charge-coupled device (CCD) semiconductor technology; CCD circuits were utilized to perform input sampling, presumming, range correlation, and azimuth correlation in the analog domain. These radar data processing functions were implemented for single-look or multiple-look imaging radar. NASA

N75-26207*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SPACE COMMUNICATION SYSTEM FOR COMPRESSED DATA WITH A CONCATENATED REED SOLOMON-VITERBI CODING CHANNEL Patent Application
Robert F. Rice (JPL) and Edward E. Hilbert, inventors (to NASA) (JPL) Filed 23 Jun. 1975 40 p
(Contract NAS7-100)
(NASA-Case-NPO-13545-1; US-Patent-Appl-SN-589173) Avail: NTIS HC $3.75 CSCL 17B

A communication system with a concatenated Reed Solomon-Viterbi coding channel for transmitting compressed and uncompressed data from a spacecraft is described. The system portion in the spacecraft includes a data compressor which compresses data from a source. The compressed data is first coded by a Reed Solomon coder and interleaver, followed by a convolutional encoder, whose output is modulated and transmitted by a modulator/transmitter; antipodal PSK-PM modulation of a square-wave subcarrier with S-band or X-band carrier takes place. The signals transmitted from the spacecraft to earth are assumed to be subjected to wideband Gaussian noise. On earth the system includes several deep space network stations, DSNI-DSNn. Each DSN includes a receiver/demodulator which includes a

phase locked loop coherent demodulator with 3-bit quantized symbol output, which is decoded by a Viterbi decoder. NASA

N75-26208# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
PROPOSAL FOR AN AUTOMATIC SUPERVISION OF ELECTRONICALLY CONTROLLED RADAR ANTENNAS [VORSCHLAG ZUR AUTOMATISCHEN UEBERWACHUNG VON ELEKTRONISCH STEUERBAREN RADARANTENNEN]
G. Hueschelrath Nov. 1973 76 p refs In GERMAN; ENGLISH summary
(Rept-209) Avail: NTIS HC $4.75

Automatic test equipment design is described for phased array antennas which detects the failure of modules and phase errors in each channel. A block diagram was developed, tested, and optimized by computer simulation. The system is shown to be feasible and offers the possibility (notwithstanding the large number of individual channels) of including cheaper components and yet maintaining a highly reliable operation. The phase calculator needs to be modified in order to avoid the transmission of at least 8 impulses in the same direction. As a result, the testing time at the transmitter could be shortened by a factor 4 and, at the receiver, by a factor 8. A restriction on normal radar operation with respect to supervision would be eliminated. ESRO

N75-26209# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
ELRAS: A REAL TIME SIMULATION SYSTEM FOR ELECTRONICALLY CONTROLLED RADAR [ELRAS, EIN ECHTZEITSIMULATIONSSYSTEM FUER ELEKTRONISCH GESTEUERTES RADAR]
G. VanKeuk Jul. 1974 37 p refs In GERMAN; ENGLISH summary
(Rept-222) Avail: NTIS HC $3.75

A multifunctional real time system for data processing and control of electronically scanning radar is described. The system consists of three computers. One of these acts as a simulator, running a pseudo real time simulation program, and the rest of the system is used for real data processing. The structure of the system is detailed. ESRO

N75-26210# Facility Checking Squadron (1866th) (AFCS), Richards-Gebaur AFB, Mo.
TRACALS EVALUATION REPORT. RADAR STATION EVALUATION REPORT, DULUTH IAP, MINNESOTA
Robert L. Cranston 23 Sep. 1974 91 p
(AD-A004840; Rept-7466R/20) Avail: NTIS CSCL 17/7

This Radar Traffic Control and Landing Systems (TRACALS) station evaluation report presents data collected to define the capabilities and limitations of the Mobile Radar Approach Control Facility (AN/MPN-14) at Duluth International Airport, Minnesota. Included in the report are descriptions of the upper, lower, outer and inner fringes of the useable radar coverage; radar coverage diagrams; ATCRBS coverage and tracking capabilities; analysis of flight and performance data; and performance predictions of these systems. The data presented in this report can be used as a valid guide for anticipated performance until there is an addition, deletion or relocation of equipment which would change the facility's capability or until a change occurs in the horizontal profile. GRA

N75-26211# Ohio State Univ., Columbus. ElectroScience Lab.
CONTROL OF ELECTROMAGNETIC SCATTERING BY ANTENNA IMPEDANCE LOADING
Shi-Chuan Lee Jul. 1974 83 p refs
(Contract F19628-72-C-0203; AF Proj. 5635)
(AD-A004134; ESL-3424-2; AFCRL-TR-74-0426) Avail: NTIS CSCL 17/4

The application of impedance loading techniques for the reduction of backscatter from radar targets were studied. The hybrid methods which combine the GTD and the moment method were used to analyze the backscattering from various geometries such as impedance loaded infinite wedge and a two-dimensional wing model. The effect of both the trailing and the leading edge was considered by using a two-dimensional wing model. The edge diffraction source can be considerably reduced over a 3:1 frequency band for the two-dimensional case. The square plate with a loaded slot was analyzed by a wire grid model. The backscatter reduction of the square plate can be achieved at least over a 2:1 frequency band. GRA

N75-26212# Ohio State Univ., Columbus. ElectroScience Lab.
COMPUTATIONAL TECHNIQUES FOR SATELLITE ANTENNAS AND ANTENNA SYSTEMS Final Report, 1 Jul. 1972 - Dec. 1974
Gary A. Thiele Dec. 1974 25 p refs
(Contract N00014-67-A-0232-0018)
(AD-A003557; ESL-3468-5) Avail: NTIS CSCL 09/5

This final report summarizes applied research and development beginning 1 July 1972 to investigate problems related to satellite antennas. The investigations undertaken and described concern: satellite antenna hardware development and the computer prediction of satellite antenna radiation patterns. The report concludes with recommendations for future investigations leading to improved satellite antenna techniques. GRA

N75-26213# Naval Postgraduate School, Monterey, Calif.
SECURE FLIGHT-DECK COMMUNICATIONS M.S. Thesis
Serhat Ahmet Bac Dec. 1974 39 p refs
(AD-A003793) Avail: NTIS CSCL 17/2

A practical solution to the problem of realizing a signal transmission method for a secure voice communications system on an aircraft carrier flight-deck was the objective of this investigation. By using a very low frequency, less than 100 KHZ, and small coils, radiation was minimized. The resultant device was an audio transceiver MODEM in which narrow-band frequency modulation was applied at a carrier frequency of 50 KHZ by a voice signal bandlimited from 300 HZ to 3 KHZ to enable application of the communications scheme. The system was demonstrated by building a portion of a complete system on a simulated steel flight-deck. GRA

N75-26214# Naval Electronics Lab. Center, San Diego, Calif.
SIMULATION OF PARALLEL SEQUENTIAL DECODING
J. G. Dodds 15 Nov. 1974 19 p refs
(NELC Proj. N438; XR02105001)
(AD-A004164; NELC/TD-374) Avail: NTIS CSCL 09/4

A primary concern in the performance analysis of a communication system is reliability -- output error rate as a function of noise in the communication link. Errors introduced by noise can be effectively removed by employing error correcting codes. These codes add controlled redundancy at the input to the link and use this redundancy at the receive end to detect and correct certain classes of errors. This document describes a communication system designed to extract reliable information from data transmitted over a noisy communication link through the use of modified sequential decoding. GRA

N75-26215# Naval Electronics Lab. Center, San Diego, Calif.
SHIP-TO-SHIP TACTICAL (GROUNDWAVE RANGE) HF COMMUNICATIONS. (PERFORMANCE PREDICTIONS IN GRAPHICAL FORM)
W. H. Kelly 1 Jan. 1974 11 p refs
(AD-A003862; NELC/TD-379) Avail: NTIS CSCL 17/2

The document addresses ship-to-ship tactical hf communications (groundwave distances over seawater). It provides performance predictions in ready-to-use graphical form, and discusses transmission system factors that influence system performance. It suggests a deviation from the traditional procedure of tactical hf frequency assignment (static assignment in the 2-6-MHz band) to a more dynamic assignment procedure by making assignments based upon the tactical situation and performance predictions covering the entire hf band. The predictions show that under certain conditions expected hf groundwave ranges will be greater in the 10-20-MHz band than at 2 MHz. Further, they indicate that atmospheric noise has considerable influence over performance and that shipboard hf antenna system improvement can provide significant improvement in system performance. GRA

N75-26216# California Univ., Los Angeles. Dept. of Computer Science.
COMPUTER NETWORK RESEARCH Semiannual Technical Report, Jul. - Dec. 1973

Leonard Kleinrock 31 Dec. 1973 307 p refs
(Contract DAHC15-73-C-0368; ARPA Order 2496)
(AD-A004167) Avail: NTIS CSCL 17/2

This report considers a packet switching technique applicable to packet communication using a satellite or ground radio channel. The objective of this research is to develop analytic models for the evaluation and optimization of the system performance in terms of stability, throughput and delay. Advantages of packet switched satellite and ground radio systems over conventional wire communications for large computer-communication networks are discussed. The emphasis of this research is on a highspeed channel shared by a large population of small users. GRA

N75-26217# Army Communications Command, Fort Huachuca, Ariz. Advanced Concepts Office.
DESIGN CURVES FOR OPTICAL WAVEGUIDE DIGITAL COMMUNICATION SYSTEMS
R. L. Gallawa Dec. 1974 176 p refs
(AD-A003994; ACC-ACO-12-74) Avail: NTIS CSCL 17/2

This report contains a series of curves intended to assist the communicator in specifying an optical waveguide digital communication system. The important parameters considered are pulse rate, distance between repeaters and cost. The parameters selected to present specific data are realistic, albeit arbitrary. Both the single mode and multimode fibers are considered; the latter category includes both the step-index and graded-index fibers. Discussion and curves are given to show the transition from dispersion-limited to detector-noise-limited operation. A measure of cost is defined to assist the communicator in specifying values of pulse rate if cost is, in fact, a design parameter. GRA

N75-26218# Naval Postgraduate School, Monterey, Calif.
SHIP SYSTEMS INTERFACE USING DIGITAL TECHNIQUES M.S. Thesis
Donald Ernest Olbert Dec. 1974 60 p refs
(AD-A003790) Avail: NTIS CSCL 17/2

The use of a multiple access, time division multiplexed, data bus for interfacing ship systems is developed by first discussing the various sections of such a system and then presenting a system that could be constructed using commercially available components. The shipboard command and control advantages as well as labor, material and weight savings are discussed in the Summary. GRA

N75-26219# Computer Sciences Corp., Falls Church, Va.
TOPICS IN SYSTEM GENERATED ELECTROMAGNETIC PULSE ANALYSIS AND SIMULATION Final Report, Jan. - Dec. 1973
E. P. Wenaas, E. P. DePlomb, R. C. Keyser, and A. H. Woods Aug. 1974 158 p refs Prepared in cooperation with Intelcom Rad Tech.
(Contract F29601-72-C-0124; AF Proj. 4695)
(AD-A003681; AFWL-TR-74-85) Avail: NTIS CSCL 20/14

The purpose of this document is to compile a number of memos prepared during 1973 on System Generated Electromagnetic Pulse (SGEMP) problems relating to satellites. The original seven memos were concerned with three specific areas: Satellite Response Modeling, Electron Environment and SGEMP, and Experimental Verification. Each memo has been revised and appears as a separate section in this document. Calculations employing appropriate simplifying assumptions are presented for several problems of interest. GRA

N75-26220# Maryland Univ., College Park. Dept. of Electrical Engineering.
SCATTERING MATRIX SYNTHESIS IN C* ALGEBRAS Interim Report
R. W. Newcomb and P. M. Monteiro 1974 10 p refs
(Grant AF-AFOSR-1910-70; AF Proj. 9749)
(AD-A003660; AFOSR-74-1848TR) Avail: NTIS CSCL 17/2

The concept of synthesis is introduced into the C*-algebra framework. Then several syntheses of elements in the C*-algebra are presented with emphasis upon that for a passive operator synthesized through a lossless embedding. Author (GRA)

N75-26221# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
INTERPRETATION OF MICROWAVE ANTENNA RESULTS FROM A REENTRY FLIGHT TEST: A COMPARISON OF METHODS Physical Sciences Research Papers
John F. Lennon and J. Leon Poirier 19 Aug. 1974 53 p refs
(AF Proj. 2153)
(AD-A004046; AFCRL-PSRP-600; AFCRL-TR-74-0389) Avail: NTIS CSCL 09/5

This is one of a series of reports on the Trailblazer 2 program. The particular aspect treated here involves the unmodified expansion-region plasma and its effect on an antenna located on the vehicle shoulder. This report describes some of the theoretical approaches used, discusses the levels of approximation involved, and shows the agreement between these various methods and the test data. The failure of a single set of assumptions to yield consistent agreement over a range of altitudes confirms the need to adopt flow models appropriate to the changing regimes encountered during reentry. One significant conclusion is that performance characteristics such as reflection and interantenna coupling which depend mostly on the level of peak electron density can be represented by simple plane wave, as well as by the more sophisticated slot antenna models. The latter approach, however, is necessary to describe propagation across the entire plasma sheath. GRA

N75-26222# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ANALYSIS AND SYNTHESIS OF SPATIAL FILTERS THAT HAVE CHEBYSHEV CHARACTERISTICS Physical Sciences Research Papers
Robert J. Mailloux 13 Sep. 1974 36 p refs
(AF Proj. 6746)
(AD-A004047; AFCRL-PSRP-601; AFCRL-TR-74-0455) Avail: NTIS CSCL 09/5

Stratified dielectric filters in the spatial domain are being synthesized by a new Chebyshev technique recently developed at AFCRL. Used as radomes at the face of an array, these filters can control the residual grating lobes that plague limited sector-scanning and multiple-beam arrays in airport precision-approach radar (PAR) systems and synchronous satellite communications antennas. Formulas and charts are given for designing two-, three-, and four-layer filters. The characteristics of several four-layer filters are compared and discussed. GRA

N75-26223# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR TECHNIQUES PROGRAM Quarterly Technical Summary Report, 1 Jul. - 30 Sep. 1974
Charles E. Muehe 15 Oct. 1974 24 p refs
(Contract F19628-73-C-0002; AF Proj. 2027)
(AD-A003678; ESD-TR-74-292) Avail: NTIS CSCL 17/9

This is the fifth Quarterly Technical Summary covering the development of an airborne Multiple-Antenna Moving-Target Surveillance Radar (MASR) which employs special antenna and signal-processing techniques to provide continuous, wide-area surveillance of moving targets on or near the ground. Such a sensor, equipped with an appropriate data-reduction facility, can provide useful real-time information to a Tactical Air Control System. A DeHavilland Twin Otter medium-size commercial commuter/utility airplane has been selected as the test platform for the Phase I program, replacing the previous aircraft, a C-135A military transport. An open-ended rectangular waveguide cavity design has been selected for the radiating elements for the DPCA. Fabrication of test modules is under way. The RF/IF subsystem for the interim roof-mounted radar has been completed and loop testing with the digital equipment has started. A moving-target signal simulator has been used to test the receiver/exciter. Adequate performance has been demonstrated. GRA

N75-26224# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE LES-8/9 UHF DOWNLINK CODE
David B. Coomber, Thomas S. Seay, Gloria G. Lilas, and Edward Weiss 12 Dec. 1974 29 p refs
(Contract F19628-73-C-0002; AF Proj. 2029)
(AD-A003680; TN-1974-54; ESD-TR-74-343) Avail: NTIS CSCL 17/2

The derivation and properties of the LES-8/9 UHF downlink code are given. This non-linear orthogonal 8-ARY, 4-chip code

permits efficient downlink acquisition without separate preambles. GRA

N75-26225# School of Aerospace Medicine, Brooks AFB, Tex.
ACOUSTIC ALTERATION OF SPEECH PROCESSED THROUGH AIR FORCE AIRCRAFT COMMUNICATION SYSTEMS Interim Report, Dec. 1972 - May 1973
Donald C. Gasaway Nov. 1974 12 p refs
(AF Proj. 7755)
(AD-A003625; SAM-TR-74-37) Avail: NTIS CSCL 17/2

Speech picked up at the speaker's lips and processed through standard Air Force electroacoustic-communication systems undergoes acoustic alteration that affects intelligibility. Features of such acoustic alteration and its importance to Air Force operations are presented. GRA

N75-26226# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
ANALYSIS OF RADIATION BY LINEAR ARRAYS OF PARALLEL HORIZONTAL WIRE ANTENNAS OVER IMPERFECT GROUND
Tapan K. Sarkar and Bradley J. Strait 1 Sep. 1974 32 p refs
(Contract F19628-73-C-004716; AF Proj. 5635)
(AD-A004131; SR-3; AFCRL-TR-74-0538) Avail: NTIS CSCL 09/5

A user oriented computer program is presented and described for analyzing radiation from linear arrays of parallel horizontal thin-wire antennas over the surface of an imperfectly conducting earth. The program is equipped to treat unequally spaced arrays of wires that can be of different lengths and radii, but it is assumed the wires are all centerfed. The wires are assumed to be unloaded and that the conductivity of the earth is finite. The effects of the imperfectly conducting earth are accounted for approximately by using the method of reflection coefficients. Computed output consists of current distributions, input impedances, and far-field patterns specified by the user. GRA

N75-26227# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OVERHEAD COMMUNICATION LINES AND RADIO RELAY NETWORKS
K. G. Levinov 4 Dec. 1974 215 p refs Transl. into ENGLISH from the monograph "Vozdushnye Linii Svyazi i Radiotranslyatsionnykh Setei" Moscow, 1972 p 9-60, 131-188, 275-281, 310-319
(AD-A004665; FTD-HC-23-1438-74) Avail: NTIS CSCL 17/2

Contents: Designation, utilization, and classification of overhead communication lines; Component elements of overhead lines, their designation and construction; Calculation of the mechanical durability of wires (conductors) and supports of overhead communication lines; Outfitting of lead-ins to booster stations; Shielding of overhead lines against hazardous interfering voltages and currents; High-frequency cable and conductor of the surface wave line on supports of overhead communications lines. GRA

N75-26228# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
FAR FIELD ANTENNA PERFORMANCE INVESTIGATIONS CONCERNING IN BAND EFFECTS OF NEAR FIELD STRUCTURES AND OUT OF BAND PHASED ARRAYS Final Report, Feb. 1974 - Jan. 1975
F. L. Cain, B. J. Cown, E. E. Weaver, and C. E. Ryan 31 Jan. 1975 341 p refs
(Contract N00024-74-C-1215; SF9990)
(AD-A004583; GIT-A-1613-F) Avail: NTIS CSCL 09/5

The report presents the results of studies involving (1) the effects on far-field antenna performance of obstacles located in the near-field of an antenna, and (2) derivation of statistical models for predicting the out-of-band performance of waveguide phased-array antennas. In the first area, empirical data were recorded to determine the degrading effects of near-field blocking obstacles and reflecting objects on gain loss (decoupling), beamshift, beamwidth, and sidelobe levels of microwave radar antennas. The data were recorded for two parallel-polarization senses. In the second area, a previously-derived basic theoretical statistikal model for predicting out-of-band phased-array characteristics was expanded to include arrays of waveguide elements which randomly propagate higher-order modes. Statistical equations were derived to predict and describe the out-of-band radiation pattern characteristics and median gain as a function of the in-band scan angle of the array. GRA

N75-26229# Naval Electronics Lab. Center for Command Control and Communications, San Diego, Calif.
HF ANTENNA SYSTEM FOR FRG VARIANT NATO PHM
J. H. Thorton 1 Jan. 1975 36 p
(NELC Proj. J607)
(AD-A004556; NELC/TD-381) Avail: NTIS CSCL 09/5

A NELC scale model of the PHM(Patrol Hydrofoil Missile) was reconfigured to conform to the Federal Republic of Germany PHM ship structure and AEG-Telefunken recommended antenna system arrangement. Antenna system measurements were made, and the results are presented in this document. The antenna locations recommended by AEG-Telefunken provide the maximum space isolation possible between hf antennas. The measurements revealed a potential radiation hazard to a missile system, and the document recommends that field level susceptibility of the FRG Variant PHM weapon systems be determined. GRA

N75-26230# Mitre Corp., Bedford, Mass.
CLUTTER SUPPRESSION BY MEANS OF DIGITAL MTI AS APPLIED TO PRECISION APPROACH RADAR
R. J. Long Dec. 1974 71 p refs
(Contract F19628-73-C-0001)
(AD-A004475; MTR-2851; ESD-TR-74-304) Avail: NTIS CSCL 17/9

A major concern in the design of X-Band precision approach radars is the detection and tracking of aircraft in heavy rain clutter. The objective of the investigation was to explore the ability of a particular digital band-pass filter to discriminate Doppler shifted aircraft from such clutter. The filter was designed and tested in software using complementary PRFs. Rain clutter was modeled statistically using realistic parameters. GRA

N75-26231# Naval Postgraduate School, Monterey, Calif.
FM-CW LASER RADAR AT 10.6 MICRONS M.S. Thesis
Thomas Henry Chance Dec. 1974 117 p refs
(AD-A003856) Avail: NTIS CSCL 17/5

The feasibility of a continuous-wave frequency-modulated radar with a CO2 laser as a transmitting source was investigated. A developmental system was constructed and tested and the feasibility of an optical radar using coherent detection at 10.6 micrometers was demonstrated. The radar had the capability of instantaneous range and velocity determination. GRA

N75-26232# Army Electronics Command, Fort Monmouth, N.J.
A DETERMINISTIC PROPAGATION MODEL FOR THE ROUGH EARTH Technical Report, Dec. 1973 - Jun. 1974
Nello R. Castellini Nov. 1974 89 p refs
(DA Proj. 1S7-62701-AH-92C)
(AD-A003840; ECOM-4280) Avail: NTIS CSCL 20/14

The paper develops a deterministic mathematical model for the prediction of the field generated at any point by radio wave propagated over the rough earth. The model considers all wave paths associated with surface discontinuities and identifies those that contribute to a first order approximation. It accounts for the effects of refraction, reflection and diffraction and gives formulas for the terminal field and for the reflection coefficient. GRA

N75-26233# Purdue Univ., Lafayette, Ind.
PERFORMANCE MONITORS FOR DIGITAL COMMUNICATIONS SYSTEMS, PART 2
B. J. Leon, J. L. Hammond, R. B. Bode, and W. E. Sears Dec. 1974 178 p refs Prepared in cooperation with Georgia Inst. of Tech.
(AD-A004211; RADC-TR-74-318) Avail: NTIS CSCL 17/2

The report consists of three parts. The first part investigates performance monitors for a digital system that uses a three-level partial response wave form for digital signaling. A hybrid simulation of such a system was made and various methods of amplifying the bit error rate were investigated. It was found that a null zone detection scheme was the best monitor. The second section of the report investigates an extension of the pseudo-error concept

from DCEO H700-1 to a monitor scheme that examines the received signal and classifies the signal in various bins. The report discusses the relation between the number of signals received in each bin with various sources of system degradation. This approach shows promise for fault isolation. The third section of the report deals with the problem of synchronization in a digital system. It shows how synchronization can be monitored by estimating the statistical parameters of buffer storage. GRA

N75-26234# Ohio State Univ., Columbus. ElectroScience Lab.
MULTIFUNCTION TDMA TECHNIQUES Annual Technical Report, 1 Feb. 1973 - 31 Jan. 1974
R. J. Huff Dec. 1974 43 p refs
(Contract F30602-72-C-0162; AF Proj. 6523)
(AD-A004196; ESL-3364-3; RADC-TR-74-327; TR-2) Avail: NTIS CSCL 17/2

Concepts and techniques needed to instrument time division multiple access (TDMA) satellite communication systems containing a large number of small, highly-mobile terminals, e.g. aircraft, are being developed under a three year contract with the United States Air Force. Progress made during the second year of that contract is described in the report. The work has involved the development of prototype TDMA satellite communication modems and the evolution of techniques and associated technological bases needed to incorporate adaptive null-steering arrays in TDMA systems. An overview of the results obtained to date is given and the tasks to be performed during the remainder of the contract are described. GRA

N75-26235# Naval Postgraduate School, Monterey, Calif.
A PULSE MODULATED LASER COMMUNICATIONS SYSTEM M.S. Thesis
John James Sulfaro Dec. 1974 66 p refs
(AD-A004291) Avail: NTIS CSCL 17/2

A system for line-of-sight voice communications using Laser technology as the information carrier was constructed. Photodiode detection techniques were used in the receiver section. Emphasis was placed on compactness so maximum use of Integrated circuits was made. A one-way communications system was built. The concept could be employed for secure communications as on the flight decks of aircraft carriers. GRA

N75-26236# Naval Postgraduate School, Monterey, Calif.
HYBRID METHOD OF SINGLE SIDEBAND SIGNAL GENERATION M.S. Thesis
Sugihono Kadarisman Dec. 1974 190 p refs
(AD-A004253) Avail: NTIS CSCL 17/2

The Hybrid SSB-signal generation method is introduced. It is a combination of phase-shift and filter methods in SSB-signal generation. The motivation is to design a high degree of unwanted signal suppression with less complexities. Computer analysis is used to determine the correct time-constants to achieve high degree phase-shift accuracy. The way is open for designing an even higher degree of performance by increasing the all-pass network order or the number of Chebyshev function poles within a reasonable practicality. Due to effective use of the phase-shift method, the hybrid-method has a significant advantage in the low audio frequency range and helps the burdens of the demodulation process. GRA

N75-26237# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A GENERALIZED APPROACH TO LINEAR METHODS OF FEATURE EXTRACTION
Charles W. Therrien 30 Dec. 1974 21 p refs
(Contract F19628-73-C-0002; DA Proj. 8X3-63304-D-215)
(AD-A004212; TN-1974-59; ESD-TR-74-348) Avail: NTIS CSCL 17/9

An approach to feature extraction based on functions of the class correlation matrices is described. If linear functions of the correlation matrices are chosen, the present method extends the methods of feature extraction proposed by Fukunaga and Koontz. If certain types of non-linear functions are employed, the method reduces to the orthogonal subspace method of Watanabe and Pakvasa. Optimization of selected features through selection of appropriate functions is discussed briefly. Preliminary results of classification of radar signatures using the feature extraction methods described here are presented. GRA

N75-26238# Lincoln Lab., Mass. Inst. of Tech., Lexington.
APPLICATION OF ADAPT TO QUICK LOOK CLASSIFICATION OF COMPOSITE RADAR SIGNATURES Final Report, Nov. 1973 - Nov. 1974
Herbert E. Hunter Nov. 1974 197 p ref Prepared in cooperation with Adapt Service Corp., Reading, Mass.
(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-215)
(AD-A004206; ADAPT-74-4; ESD-TR-74-345) Avail: NTIS CSCL 17/9

The ADAPT Computer Programs (a series of empirical analysis programs based on the concept that pattern recognition and regression analysis should be preceded by a reduction in the dimensionality based on the Karhunen-Loeve expansion) were applied to composite radar signatures of two classes of targets to develop and study classification laws and mechanisms for separating the two classes. The analysis showed that the 10 pulse signatures were adequate for the classifications desired and illustrated several mechanisms for classifications based on the differences in the characteristics of the means of the two classes. The analysis also showed that the most effective classification scheme for separating the two types of targets was based on the significantly greater variation observed in the second class of targets. GRA

N75-26239# Rome Air Development Center, Griffiss AFB, N.Y.
INTRODUCTORY STATISTICAL ANALYSIS OF WIRELINE TRANSIENTS AND ERROR PATTERNS Report for 2 Jul. - 3 Sep. 1974
William T. Lynch Jan. 1975 33 p refs
(AD-A004769; RADC-TR-74-324) Avail: NTIS CSCL 17/2

The investigation of analog wireline transients is discussed from the point of view of modeling the digital error patterns which the transients produce. A detailed explanation of the transient and error pattern collection systems is presented. The analytical approach used is a qualitative comparison of the statistical distributions of transients and error bursts. The analysis reveals that, at a data rate of 9600 bits per second, the error bursts occur according to a Poisson process over half the time, but non-Poisson process(es) predominate at 4800 bps. The occurrences of the transients are found to always differ from a Poisson process. This is interpreted as evidence that something other than transients causes the Poisson distributed error bursts; an alternative cause is briefly discussed. Also, a cause-effect relationship for transients and non-Poisson bursts is postulated. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-26240 British Library Lending Div., Boston Spa (England).
SWITCHING CHARACTERISTICS IN GLASS SEMICONDUCTORS
Homma Kazuaki 14 May 1974 3 p refs Transl. into ENGLISH from IECE Conv. Record (Japan), 1970 p 761
(BLL-CE-Trans-5736-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The switching phenomenon in glass semiconductors is disscussed. A model is presented showing the switching characteristics. M.C.F.

N75-26241 British Library Lending Div., Boston Spa (England).
THE ELECTRICAL CHARACTERISTICS OF PLASTIC INSULATING MATERIALS FOR HIGH VOLTAGE DC CABLES
Y. Fujiwara, H. Shimanuki, F. Aida, and I. Okumura 18 Feb. 1975 20 p refs Transl. into ENGLISH from Showa Wire and Cable Review (Japan), vol. 22, no. 1, 1972
(BLL-CE-Trans-6546-(9022.09)) Avail: British Library Lending, Boston Spa, Engl.: 2 BLL photocopy coupons

The need for dc power transmission in Japan has intensified in recent years. Although there is an extensive literature on oil-impregnated paper as high voltage dc cable insulation, very little has yet been published on the dc characteristics of plastic materials. Investigation of the basic electrical characteristics of plastic insulators in sheet and cable form indicated that cross-linked polyethylene incorporating a voltage stabilizer is an excellent material for high voltage dc cable insulation. Author

N75-26242 British Library Lending Div., Boston Spa (England).
HYBRID ac AND dc TRANSMISSION OF ELECTRIC POWER
Z. Fett [1974] 21 p refs Transl. into ENGLISH from Elektrotech. Obz. (Czechoslovakia), v. 62, no. 12, 1973 p 712-720
(BLL-CE-Trans-6431-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Hybrid power transmission systems are briefly discussed with emphasis on the requirements to ensure steady operation of a mixed a.c./d.c. transmission system. Author

N75-26243* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CORRELATION TYPE PHASE DETECTOR Patent
William D. T. Davies (Bell Aerospace Co., Buffalo) and Stephen C. Martin, inventors (to NASA) (Bell Aerospace Co., Buffalo) Issued 1 Apr. 1975 7 p Filed 20 Apr. 1973 Supersedes N73-23291 (11-14, p 1640) Sponsored by NASA
(NASA-Case-GSC-11744-1; US-Patent-3,875,394;
US-Patent-Appl-SN-353162; US-Patent-Class-235-181;
US-Patent-Class-179-15BC; US-Patent-Class-235-150.53;
US-Patent-Class-324-83Q; US-Patent-Class-328-133) Avail: US Patent Office CSCL 09E

The phase angles of each of a plurality of frequency multiplexed signals derived on a common lead and having predetermined frequencies are determined relative to predetermined phase angles of reference waves having the same frequencies as the signals. Correlators respond to the plural signals and reference waves to derive signals indicative of the orthogonal cross correlations of one reference wave with the signal for each frequency. The correlator includes integration means that is activated for the same time period for each cross correlation of each frequency. The integration means derives, at the end of each activation period, first and second signals respectively indicative of sin phi and cos phi for each of the frequencies. A computer responds to the first and second signals for each of the frequencies to derive an indication of phi for each of the frequencies. Official Gazette of the U.S. Patent Office

N75-26244* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS FOR CALIBRATING AN IMAGE DISSECTOR TUBE Patent
Edwin E. Klingman, III, inventor (to NASA) Issued 10 Jun. 1975 8 p Filed 5 Mar. 1974 Supersedes N74-18100 (12 - 09, p 1050)
(NASA-Case-MFS-22208-1; US-Patent-3,889,155;
US-Patent-Appl-SN-448325; US-Patent-Class-315-369;
US-Patent-Class-315-10; US-Patent-Class-315-367;
US-Patent-Class-315-387) Avail: US Patent Office CSCL 09C

An apparatus for calibrating digitally controlled image dissector tubes is described. The photosensitive screen of the tube is illuminated with a light pattern having parallel opposite edges. Then, a sweep signal is applied to the deflection coils causing the pattern to be scanned in a line perpendicular to the edges and generation of an output video pulse. The sweep signal is in the form of a time variable current whose average rate of change during the scan of the line is a constant and dependent on a settable control circuit. Measurement of the output pulse width permits the setting of the slope control circuit to be changed if the width differs from a standard associated with the tube whereby the scan rate is kept constant despite changes in the deflection sensitivity of the tube.
Official Gazette of the U.S. Patent Office

N75-26245* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RESONANT WAVEGUIDE STARK CELL Patent
Wesley C. Easley, William F. White, and George A. Wingfield, inventors (to NASA) Issued 10 Jun. 1975 4 p Filed 10 Apr. 1974 Supersedes N74-19854 (12 - 11, p 1269)
(NASA-Case-LAR-11352-1; US-Patent-3,889,182;
US-Patent-Appl-SN-459736; US-Patent-Class-324-58.5A;
US-Patent-Class-23-254E; US-Patent-Class-324-58.5C) Avail: US Patent Office CSCL 09C

A resonant waveguide Stark cell suitable for use in a Stark-modulated microwave spectrometer was developed. The cell is constructed from a short guide of waveguide. A Stark electrode is located inside the wavelength parallel to the broad face of the guide and insulated from the walls of the guide with narrow teflon strips. A reflector with a small coupling iris at its center is located at one end of the cell. This small coupling iris is for passing microwave energy into and out of the cell. At the other end of the cell there is an adjustable waveguide short making the small Stark cell into a tuneable cavity which can be tuned for resonance at selected microwave frequencies. Means are provided for maintaining a gas-tight compartment within the cell, and ports are provided for the introduction of the gas to be analyzed into the gas-tight compartment.
Official Gazette of the U.S. Patent Office

N75-26246* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LIGHTNING CURRENT MEASURING SYSTEMS Patent
Ronald J. Wojtasinski, James H. Jones, and Raymond V. Lisle, inventors (to NASA) Issued 10 Jun. 1975 5 p Filed 15 Apr. 1974 Supersedes N74-22113 (12 - 13, p 1557)
(NASA-Case-KSC-10807-1; US-Patent-3,889,185;
US-Patent-Appl-SN-461073; US-Patent-Class-324-72) Avail: US Patent Office CSCL 09C

An apparatus for monitoring and analyzing electrical currents produced by lightning strikes is described. The apparatus includes an electrical conductive mast with a circuit coupled to it for generating a dc voltage proportional to a peak current generated in the mast by each lightning strike. Another circuit is coupled to the mast for generating a digital signal representative of the wave shape of the current generated in the mast by each lightning strike, and a third circuit is provided closely adjacent the mast for producing a reference voltage. Signals are fed into a strip chart recorder making a permanent record of the current produced by the lightning strike.
Official Gazette of the U.S. Patent Office

N75-26247 Stanford Univ., Calif.
HIGH VOLTAGE SILICON GATE MOS INTEGRATED CIRCUITS Ph.D. Thesis
Krishna Chandra Saraswat 1975 134 p
Avail: Univ. Microfilms Order No. 75-13593

A high voltage silicon gate MOS transistor was introduced. By incorporating a polycrystalline silicon field plate around the drain junction, the breakdown voltage of the junction can be increased up to 180 volts. An analysis of the effect of field plate on the breakdown voltage of a p-n junction and the MOS transistor was done. These transistors are fabricated using the conventional silicon gate technology. Therefore, for the first time, it has become possible to fabricate both the low voltage and the high voltage transistors on the same integrated circuit chip, without the incorporation of extra steps in the fabrication process. A unique scheme to control the high voltage transistor with a low gate voltage was developed. In this scheme, an MOS varactor is employed to have gate voltage dependent upon positive feedback from drain to gate. This results in increase of speed and/or reduction of the area of transistor. Dissert. Abstr.

N75-26248 Stanford Univ., Calif.
COMPLEMENTARY MOS TRANSISTORS IN MICROPOWER CIRCUITS Ph.D. Thesis
Richard Marker Swanson 1975 216 p
Avail: Univ. Microfilms Order No. 75-13609

Complementary MOS transistor (CMOST) circuits are analyzed to determine their ultimate obtainable performance, and fabrication techniques are developed that produce circuits with low power-speed product. The MOST is treated as a distributed nonlinear transmission line to investigate the detailed nature of its transient response. These methods are applied to the analysis of the switching performance of CMOST logic gates. A MOST

model is developed that describes effects that become significant at small voltages and sizes. The standard strong inversion approximation is relaxed, and the two-dimensional nature of the fields in the MOST is included. When the MOST model is combined with the CMOST performance analysis, an absolute lower bound on CMOST power consumption, supply voltage, and switching time results. A method for adjusting MOST threshold voltage by ion implantation is described. A theory that predicts the threshold as a function of the implantation parameters is developed and compared to experimental measurements. Ion implantation was used to fabricate a CMOST ring oscillator.
Dissert. Abstr.

N75-26249 Illinois Univ., Urbana.
CURRENT FLOW IN INHOMOGENEOUS SUPERCONDUCTORS Ph.D. Thesis
Jared Logan Johnson 1974 143 p
Avail: Univ. Microfilms Order No. 75-11793

The change of normal current flow into supercurrent flow was examined in a number of problems in which the pair potential of the superconductor varied spatially. The step-like pair potential the linear current response of a superconducting-normal junction that occurs with a static electric field applied normal to the boundaries is calculated. The results for the self-consistent currents and fields are found to be the same in certain limits as those found by other investigators who used semiphenomenological approaches. The linear current response of a superconductor with a pair potential which varies slowly over a coherence length to an applied alternating electric field is also examined. This result should be useful in describing the current response of very wide superconducting-normal-superconducting junctions in which a very small pair potential exists in the 'normal' region at very low temperatures in the millidegree range. Dissert. Abstr.

N75-26250 Pennsylvania State Univ., University Park.
A STUDY OF THE DIGITAL N-PATH BAND-PASS FILTER WITH SPECIAL PURPOSE APPLICATIONS Ph.D. Thesis
Donald Eugene Kerr 1974 135 p
Avail: Univ. Microfilms Order No. 75-10797

The N-path, particularly in the narrow bandpass area, is shown to have distinct advantages over filters realized by the standard low-pass to bandpass transformation. The main advantages are reduced computational requirements, lower coefficient quantization sensitivities and characteristics that make the filter amenable to certain special purpose filter problems. The basic digital N-path bandpass filter accepts N-th order sampled data. Each of the N-th order interwoven sequences is individually filtered by one of N identical low-pass filters. The outputs of the N low-pass filters are combined to attain a bandpass which is a symmetric frequency translation of the low-pass response. The N-path filter was developed from digital N-th order bandpass reconstruction theory. The finite word length effects of the N-path configuration are examined. The filter noise, stability and coefficient quantization sensitivities are shown to depend mainly on the configuration of the low-pass paths. Dissert. Abstr.

N75-26251*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLID STATE CURRENT TRANSFORMER Patent Application
David L. Farnsworth, inventor (to NASA) (Westinghouse Electric Corp., Baltimore) Filed 23 Jun. 1975 11 p Sponsored by NASA
(NASA-Case-MFS-22560-1; US-Patent-Appl-SN-589233) Avail: NTIS HC $3.25 CSCL 09C

A signal transformation network is described which exhibits a very low input impedance while maintaining a linear transfer characteristic when driven from a voltage source and when quiescently biased in the low microampere current range. In its simplest form, it consists of a tightly coupled two-transistor network in which a common emitter input stage is interconnected directly with an emitter follower stage to provide virtually 100 percent negative feedback to the base input of the common emitter stage. Bias to the network is supplied via the common tie point of the common emitter stage collector terminal and the emitter follower base stage terminal by a regulated constant current source. The output of the circuit is taken from the collector of the emitter follower stage. NASA

N75-26252*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SWITCHABLE BEAMWIDTH MONOPULSE METHOD AND SYSTEM Patent Application
Leonard F. Deerkoski and Richard F. Schmidt, inventors (to NASA) Filed 30 May 1975 30 p
(NASA-Case-GSC-11924-1; US-Patent-Appl-SN-582318) Avail: NTIS HC $3.75 CSCL 09C

In a switchable beamwidth monopulse method and system, an antenna is described, comprising a curved reflector and a first set of monopulse feeds positioned in the Airy disk. The second set of monopulse feeds is positioned outside the Airy disk in the region of first bright Airy ring. In narrow beamwidth monopulse operation, monopulse sum and difference channel patterns are obtained from the first set of feeds within the Airy disk. In wide beamwidth monopulse operation, the difference channel pattern is obtained from the second set of feeds in the Airy ring. The sum channel pattern is obtained by attenuating and phase shifting the sum channel signal obtained from the first set of feeds, and adding the resultant to the sum channel signal obtained from the second set of feeds. The difference channel patterns for both narrow and wide beamwidth mode operation are obtained from the second set of feeds. NASA

N75-26253*# Kanner (Leo) Associates, Redwood City, Calif.
AN ELECTRICAL METHOD FOR STUDYING THYRISTOR TURN-ON ACTION
A. Munoz Yague, M. M. Dorkel, and D. Esteve Washington NASA Jul. 1975 13 p refs Transl. into ENGLISH from Onde Elec. (France), v. 54, Dec. 1974 p 523-528
(Contract NASw-2481)
(NASA-TT-F-16451) Avail: NTIS HC $3.25 CSCL 09C

An electrical method is discussed for studying the thyristor conducting area after switching. The experimental procedure for obtaining the on state J(V) and switching characteristics is explained. The experimental results presented show the influence of some structure parameters, temperature, and electrical bias conditions, and show that at high current density, spreading velocity of the on-state area is nearly constant, and independent of the carried current density. Allowance for variations in temperature and consequently in the current density of the on-area does not significantly change the results obtained. Author

N75-26254# Joint Publications Research Service, Arlington, Va.
ANTENNA: FEED DEVICES
A. S. Lavrov and G. B. Reznikov 1 Jul. 1975 136 p refs Transl. into ENGLISH from the book "Sovetskoye Radio" USSR, 1974 p 262-359
(JPRS-65127) Avail: NTIS HC $5.75

Data on basic elements, assemblies, and characteristics of transmission lines and information on phased antenna arrays and housings are reported. For individual titles, see N75-26255 through N75-26258.

N75-26255 Joint Publications Research Service, Arlington, Va.
PHASED ANTENNA ARRAYS
A. S. Lavrov and G. B. Reznikov *In its* Antenna: Feed Devices (JPRS-65127) 1 Jul. 1975 p 1-17 refs Transl. into ENGLISH from the book "Sovetskoye Radio" USSR, 1974 17 p (For availability see N75-26254 17-33)

Basic features of the antenna scanning process are presented. Antenna arrays with phase scanning and frequency scanning are discussed. Electrical scanning with the help of multielement antennas is discussed showing a considerably higher shifting speed can be obtained using this method. Also, multiwire antenna arrays are described. M.C.F.

N75-26256 Joint Publications Research Service, Arlington, Va.
ANTENNA HOUSINGS
A. S. Lavrov and G. B. Reznikov *In its* Antenna: Feed Devices (JPRS-65127) 1 Jul. 1975 p 18-27 refs Transl. into ENGLISH from the book "Sovetskoye Radio" USSR, 1974 10 p (For availability see N75-26254 17-33)

The types of antenna housings are discussed showing they are classified according to shape. The dielectric covers enclosing the antenna emitters are described for aperture antenna housings.

It is shown that these covers make it possible to seal the waveguide channel and increase its electrical strength. M.C.F.

N75-26257 Joint Publications Research Service, Arlington, Va.
TRANSMISSION LINES AND THEIR MATCHING
A. S. Lavrov and G. B. Reznikov *In its* Antenna: Feed Devices (JPRS-65127) 1 Jul. 1975 p 28-68 refs Transl. into ENGLISH from the book "Sovetskoye Radio" USSR, 1974 41 p (For availability see N75-26254 17-33)

Basic characteristics of regular transmission lines are reported, and it is shown that transmission lines are used to connect a high frequency energy generator to a transmitting antenna and a receiving antenna to a receiver. A differentiation is made between regular and irregular transmission lines. The matching of transmission lines is discussed showing the complex measures necessary to create the proper conditions for the passage of the electromagnetic waves. M.C.F.

N75-26258 Joint Publications Research Service, Arlington, Va.
BASIC ELEMENTS AND ASSEMBLIES OF TRANSMISSION LINES
A. S. Lavrov and G. B. Reznikov *In its* Antenna: Feed Devices (JPRS-65127) 1 Jul. 1975 p 69-134 refs Transl. into ENGLISH from the book "Sovetskoye Radio" USSR, 1974 66 p (For availability see N75-26254 17-33)

The classification of transmission line elements and assemblies are described. Examples are given for defining the difference between elements and assemblies. The propagation of electromagnetic waves and the properties of ferrites are discussed. M.C.F.

N75-26259# Materials Research Labs., Maribyrnong (Australia).
LIGHTNING WARNING SYSTEMS AND THE PROTECTION OF TRANSISTORISED CIRCUITS FOR FIRING RANGE EQUIPMENT
K. K. M. Wu and D. W. Williams Feb. 1975 18 p refs
(MRL-TN-364) Avail: NTIS HC $3.25

A lightning warning system used in conjunction with interrupter relays is recommended as a convenient and low-cost solution to the protection of transistorized circuits against lightning damage. Phenomenological aspects of a lightning environment and associated characteristics or effects amenable to detection are reviewed. An alarm warning system based on the electrostatic field build-up several minutes prior to a lightning discharge is suggested to trigger isolation relays. The possibility of detecting the development of thunderstorm conditions by monitoring the local electric field itself or by sensing the point corona discharge current is discussed. A system based on the detection of the radiation field of lightning discharge is suggested for detecting distant thunderstorms. It is shown that a more definite indication of approaching thunderstorms may be obtained by an instrument based on the detection of the electrostatic field reversal of near lightning strikes. Author

N75-26260# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
METHOD OF MOMENTS APPLICATIONS. VOLUME 1: AN INTRODUCTION TO THE METHOD OF MOMENTS Technical Report, Feb. 1973 - Jun. 1974
A. T. Adams Nov. 1974 121 p refs
(Contract F30602-72-C-0360)
(AD-A002820; RADC-TR-73-217-Vol-1) Avail: NTIS CSCL 20/3

The volume serves the purpose of an introduction to the Method of Moments Applications Series. The basis of the method of moments is outlined and the notation and conventions used throughout the series are introduced. Illustrative examples are presented. GRA

N75-26261# General Electric Co., Philadelphia, Pa. Space Div.
VIDICON UNIFORMITY Final Report, 1 Jun. 1973 - 30 Sep. 1974
James P. Spratt 30 Sep. 1974 60 p
(Contract F19628-73-C-0267; ARPA Order 2444; AF Proj. 2444)
(AD-A003674; AFCRL-TR-74-0410) Avail: NTIS CSCL 09/1

The program has as its goal the determination of the theoretical and experimental limits of the uniformity of silicon-metal Schottky barrier array vidicon targets. Work under this program has concentrated on developing a more complete understanding of the characteristics of a beam interrogated Schottky diode. As a result of this effort, a much more realistic model has been developed of high beam velocity vidicon targets than existed previously. This model has led to an improved retina design which avoids previous problem areas, and is being studied under the continuing program (F19628-74-C-0142). It is expected that this new retina design will permit successful imaging with a metal-silicon Schottky barrier array vidicon target. GRA

N75-26262# Washington Univ., Seattle. Dept. of Physics.
ELECTRONIC PROPERTIES AND STRUCTURE OF APERIODIC MATERIALS Final Scientific Report, 1 Feb. 1967 - 30 Sep. 1974
E. A. Stern 30 Nov. 1974 47 p refs
(Grant AF-AFOSR-1967-71; AF Proj. 9764)
(AD-A003980; AFOSR-74-1912TR) Avail: NTIS CSCL 09/1

Various technological problems in the development of GaAs microwave devices are covered in this report. The work reported here includes: epitaxial growth of ultra-thin and high-resistivity films, study of the relationship between device performance and material parameters using IMPATT and LSA Gunn diodes, growth of semi-insulating substrates and characterization techniques, and study of ion implantation as a tool for microwave device fabrication. GRA

N75-26263# Cornell Univ., Ithaca, N.Y. School of Applied and Engineering Physics.
COMMENT ON OBSERVATIONS OF THERMAL FLUCTUATIONS IN SUPERCONDUCTING MICROBRIDGES
W. W. Webb and J. E. Lukens (State Univ. of New York, Stony Brook) 1 Jan. 1975 9 p refs
(Contract N00014-67-A-0077-0016; NR Proj. 319-032)
(AD-A003555; TR-24) Avail: NTIS CSCL 09/1

The interesting switching phenomena recently reported by Rachford et al. to occur at the onset of certain puzzling current and temperature dependent steps in superconducting microbridges should be considered a phenomenon yet to be explained rather than a case to which existing theory of thermally activated phase slips is directly applicable. GRA

N75-26264# Rockwell International Corp., Cedar Rapids, Iowa. Collins Radio Group.
HIGH STABILITY TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR STUDY Interim Progress Report, 1 Nov. 1973 - 30 Apr. 1974
G. E. Buroker Dec. 1974 29 p
(Contract DAAB07-73-C-0137; DA Proj. 1S7-62705-AH-94)
(AD-A003921; ECOM-73-0137-2; IPR-2) Avail: NTIS CSCL 09/5

The objective of the study is to maintain or improve the previous performance characteristics while reducing package size from 6.5 to 2.0 cubic inches. Studies pertinent to the practicality of volume production and use in tactical equipments are to be conducted, including thermally induced hysteresis, thermal transient behavior, frequency aging, and methods of reducing compensation cost. The report describes progress achieved in the second 6-month period, including results of retrace tests on crystals and capacitors, performance of thin-film circuits, and overall packaging. Model construction was delayed by a load isolation problem in the oscillator/amplifier thin film. One model has been compensated using a constant load, however, and transient and warmup tests will be completed in the next period. GRA

N75-26265# Purdue Univ., Lafayette, Ind. Solid State Devices and Materials Research Lab.
SHORT-PULSE SWITCHES FOR AIRBORNE HIGH POWER SUPPLIES Interim Report, 1 Jul. 1973 - 30 Jun. 1974
D. B. Miller, H. W. Thompson, Jr., James M. Himelick, and Richard W. Myers Aug. 1974 46 p refs
(Contract F33615-74-C-2014; AF Proj. 3145)
(AD-A003636; AFAPL-TR-74-80) Avail: NTIS CSCL 09/1

Corbino disc devices of InSb are fabricated for use as high power switches. Resistance is increased from on state to off state by application of a pulsed, coaxial magnetic field. InSb

with doping of 10 to the 15th power-10 to the 17th power donors per cc is used for switching currents from 20 to 1000 amperes. Off to on resistance ratios of 200 are observed at currents of 20 amperes. Testing at higher currents leads to a surface breakdown phenomena which limits the resistance ratio to values considerably below theoretical predication. It is proposed that proper surface passivation would eliminate this problem. Bulk silicon is also investigated for use as a high current switch. Devices have been tested with incandescent lamp, laser, and electron beam input. Though resistance changes of 2-4 orders of magnitude are observed, high contact resistance is a limiting factor in obtaining a low on resistance. The use of ion-implanted contact regions is proposed for improving contacts. GRA

N75-26266# Naval Ordnance Lab., White Oak, Md.
OBTAINING DC LARGE SIGNAL MODEL PARAMETERS FOR DIODES AND TRANSISTORS WITH THE TEKTRONIX TYPE 576 CURVE TRACER Final Report
Robert L. Martin 7 Aug. 1973 27 p refs
(AD-A003899; NOLTR-74-214) Avail: NTIS CSCL 09/1

The DC model parameters for diodes and transistors used in circuit analysis programs (NET-2, CIRCUS-II, SCEPTRE, etc.) are not readily available. The report explains how to obtain these model parameters using the Tektronix Type 576 curve tracer. The value of this technique lies in the low cost of and easy access to the equipment required. GRA

N75-26267# Naval Postgraduate School, Monterey, Calif.
HYBRID MODE ANALYSIS OF MICROSTRIP ON DIELECTRIC AND FERRITE SUBSTRATE M.S. Thesis
Ahmet Munir Tufekcioglu Sep. 1974 95 p refs
(AD-A003538) Avail: NTIS CSCL 09/1

A hybrid mode analysis of microstrip on a dielectric substrate is presented. A numerical solution for wavelength and characteristic impedance of single and coupled, balanced strips is obtained. Line parameters are shown to be very frequency dependent but in agreement with the quasi-static results of other investigators in the low frequency limit. The extension of this technique to perturbation analysis of microstrip on ferrite is also described. A numerical solution for the propagation constant is obtained. GRA

N75-26268# North Carolina Univ., Chapel Hill. Dept. of Statistics.
MATHEMATICAL STATISTICS AND COMMUNICATION THEORY Final Scientific Report, 1 Sep. 1972 - 31 Aug. 1974
Wassily Hoeffding 31 Aug. 1974 17 p refs
(Grant AF-AFOSR-2386-72)
(AD-A003982; AFOSR-75-0031TR) Avail: NTIS CSCL 09/4

A summary is presented of research conducted in the areas of mathematical statistics and communication theory. Topics covered include stochastic processes, performance analysis of array signal processors, signal to noise ratios, Gaussian processes, theorem proving, probability functions, and distribution functions. M.J.S.

N75-26269# Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURE FOR AN INTEGRATED POWER SWITCH (IPS) Quarterly Report, 18 Jul. - 17 Oct. 1974
Bill H. Terrell Nov. 1974 49 p
(Contract DAAB05-73-C-2063)
(AD-A004035; TI-03-74-59; QR-6) Avail: NTIS CSCL 09/5

The report covers the effort expended and performance achieved in the establishment of a production capability for a universally applicable switching component for use in precision power-conversion equipment. GRA

N75-26270# Teledyne MEC, Palo Alto, Calif.
DUAL MODE GUN DEVELOPMENT, PHASE 2 Final Report, 16 Apr. 1973 - 15 Apr. 1974
David Zavidil Dec. 1974 68 p refs
(Contract F30602-73-C-0190; AF Proj. 2002)
(AD-A003632; MEP-74-27; RADC-TR-74-307) Avail: NTIS CSCL 09/1

The final engineering report covers evaluation of the dual mode performance of a single unifilar helix TWT with two electron guns; a low perveance hollow beam gun for the CW mode and a high perveance solid beam gun for the pulse mode. With the exception of the gun, no other changes to the tube or focusing system were made. Detailed design data for the RF structure was obtained. Characteristics of the electron beams, including beam diameters, scallop amplitudes and, in the case of the hollow beam, the beam thicknesses were experimentally evaluated with applied magnetic field. RF performance in each mode was analyzed in detail. Comparisons were made of gain, efficiency, power output and helix current as a function of frequency. GRA

N75-26271# Microwave Associates, Inc., Burlington, Mass.
A STUDY OF THE TRANSMISSION LINE PROPERTIES OF TRAPPED INVERTED MICROSTRIP LINE Final Technical Report
Charles Buntschuh Dec. 1974 86 p refs
(Contract F30602-73-C-0354; AF Proj. 5573)
(AD-A003633; RADC-TR-74-311) Avail: NTIS CSCL 09/1

Trapped Inverted Microstrip, or TIM, line is a novel transmission line invented for the purpose of reducing the radiation from discontinuities and obtaining reduced line loss compared to conventional microstrip. TIM line also possesses several other useful features and is potentially an attractive transmission line medium for the microwave integrated circuit (MIC) technology. The objective of the study was to determine TIM line's basic transmission line properties and to provide basic design data. The scope included the line impedance and effective dielectric constant as functions of the geometrical parameters, and the characterization of simple discontinuities such as stub junctions, series gaps, impedance steps and mitre bends. It also included the design of a well-matched broad band transition from coaxial line to TIM line. The data generated was also applied to the design of a 3db branch line hybrid coupler. GRA

N75-26272# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MOISTURE RESISTANCE OF ELECTRICAL INSULATION
V. V. Maslov 4 Dec. 1974 171 p Transl. into ENGLISH from the book "Vlagostoikost elektricheskoi izolyatsi i" Moscow, Izd. vo Energiya, 1973 p 3-19, 83-163, 170-185, 193-201
(AD-A004344; FTD-HC-23-1543-74) Avail: NTIS CSCL 09/1

The book is devoted to problems of moisture resistance and water resistance of electrical insulation and electrical-insulation materials used in low-voltage electrical machines and apparatuses. Processes of the moistening of electrical insulation materials and electrical insulation systems are considered, as well as changes in electrical characteristics, methods of testing for moisture and water resistance. The physical interpretations of the processes of diffusion of moisture in electrical insulation material, the forms and types of the connection of moisture with a dielectric, and the electrical conductivity of a wetted dielectric are given. Recommendations are given with respects to methods of the protection of insulation against wetting. GRA

N75-26273# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
INFLUENCE OF SOLID STATE ELECTRICAL DISTRIBUTION ON AIRCRAFT POWER GENERATION SOLID STATE POWER CONTROLLER COMPATIBILITY Final Report, Jan. - Aug. 1974
S. Dawson, J. E. Phillips, and R. Urdanivia 27 Jul. 1974 228 p
(Contract F33615-72-C-1759; AF Proj. 3145)
(AD-A003834; AFAPL-TR-74-86) Avail: NTIS CSCL 09/3

A compatibility study and engineering test evaluation on solid state power controllers (SSPC) was conducted to provide documentation and technical information to the Air Force of the factors needed for the technical decision of compatibility of SSPC on the B-1 air vehicle. Part I of this report documents the Baseline, Analysis, Weight-Volume NA-72-229-1. The Supplement to the report contains a summary of a series of evaluation tests on Solid State Power Controllers. The tests were intended to verify operational characteristics of these devices in simulated B-1 environments and with simulated and actual B-1 loads. GRA

N75-26274# IBM Federal Systems Div., Huntsville, Ala. Federal Systems Div.

TECHNOLOGY AND FABRICATION SUPPORT FOR THICK FILM MICROELECTRONICS AND PRINTED WIRING BOARDS Final Report
G. Schrottke Jun. 1974 21 p refs
(Contract DAAH01-74-C-0363)
(AD-A004757; DI-S-1800; IBM-74W-00183) Avail: NTIS CSCL 09/5

Potential applications for hybrid microelectronics in Army Missiles were to be evaluated and sample hardware designed, fabricated and tested. Of particular interest was the design approaches, processing methods and fabrication techniques. The application selected to be the prime demonstration vehicle was the THAD Six Inch Missile Autopilot. The specific objectives with respect to this technology evaluation were to design, fabricate and evaluate hybrid modules to perform the circuit functions of the existing discrete design and to design a multilayer printed wiring board and third level package to the point that the overall impact of the hybrid microelectronics packaging approach could be compared with the discrete design at the Autopilot subassembly level. GRA

N75-26275# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
WIDEBAND DISPERSIVE SURFACE WAVE FILTERS Final Report, 14 Oct. 1973 - 1 Oct. 1974
H. M. Gerard, O. W. Otto, and R. D. Weglein Dec. 1974 51 p refs
(Contract DAAB07-73-C-0110F; DA Proj. 7X2-63304-D-215)
(AD-A003849; ECOM-73-0110-F) Avail: NTIS CSCL 09/5

The results of this program clearly demonstrate that broadband, large dispersion reflective array filters can be readily implemented, noniteratively, based on a simple design model. With careful control on filter fabrication and measurement, corrections in the phase response can be introduced to achieve a high sidelobe suppression capability. To the small extent that ideal performance was not achieved in the present device, the inadequacies proved to be associated with the transducer rather than reflective grating limitations. From the excellent agreement between theory and measurement, it is safe to conclude that it is quite feasible to achieve required transducer equalization through non-iterative compensations in the reflective grating design. GRA

N75-26276# SACLANT ASW Research Center, La Spezia (Italy).
NEOPRENE VULCANIZATION FOR WATERPROOFING OF UNDERWATER CABLE SYSTEMS
Bruno Miaschi and Knud E. Rasmussen 1 Oct. 1974 24 p refs
(AD-A004782; SACLANTCEN-SM-55) Avail: NTIS CSCL 09/1

Some equipment operated at sea requires the use of electric cables to connect electronic packages with hydrophones, transducers, etc. It is essential to guarantee a waterproof seal to the cable junction. The procedures evolved at SACLANTCEN to design and manufacture watertight seals on Neoprene sheathed cables are described. GRA

N75-26277# Stanford Univ., Calif. High Energy Physics Lab.
SUPERCONDUCTING-CAVITY STABILIZED OSCILLATORS OF 6 X 10 TO THE MINUS 16TH POWER STABILITY
S. R. Stein and J. P. Turneaure Dec. 1974 8 p refs
(Contract N00014-67-A-0112-0076)
(AD-A004267; SU-HEPL-746) Avail: NTIS CSCL 09/1

Superhigh frequency microwave oscillators are discussed which were stabilized with superconducting niobium cavities with loaded Q's of about 10 to the 10th power. They achieved short-term frequency stabilities as low as beta sub y=6 x 10 to the minus 16th power and typical long-term fractional frequency drift of + or - 2 x 10 to the minus 13th power per day. GRA

N75-26278# Radio Corp. of America, Lancaster, Pa. Industrial Tube Div.
DEVELOPMENT OF BASIC COLD-CATHODE MATERIALS AND FABRICATION OF TEST DIODES Final Report, 5 Dec. 1973 - 5 Dec. 1974
Gilbert N. Butterwick Jan. 1975 88 p refs
(Contract N00039-74-C-0125)
(AD-A004657) Avail: NTIS CSCL 09/1

The work accomplished resulted in the successful completion of all the established program milestones. Specifically these milestones include: (1) The development of cold-cathode processing techniques, which resulted in activation to emission levels of 90 micro A beam current, which corresponds to about 4 A/sq cm beam current density. (2) Development of cathode transfer and tube seal technology which resulted in three successful transfers and seals out of three tries. (3) Fabrication of a functional cold-cathode tube from which emission velocity distribution measurements were made. (4) Fabrication of a hot-cathode tube from which emission velocity distribution measurements were made. (5) Development of emission velocity measurement instrumentation and the completion of tests. GRA

N75-26279# National Bureau of Standards, Washington, D.C. Building Environment Div.
A PRELIMINARY APPROACH TO PERFORMANCE REQUIREMENTS AND CRITERIA FOR ELECTRICAL CONNECTIONS IN RESIDENTIAL BRANCH CIRCUIT WIRING Final Report
William J. Meese, Ramon L. Cilimberg, and Adolpho A. Camacho Mar. 1975 38 p refs Sponsored in part by HUD
(COM-75-10338/2; NBSIR-75-672) Avail: NTIS HC $3.75 CSCL 09A

During the Operation BREAKTHROUGH Research and Demonstration program the U.S. Department of Housing and Urban Development became concerned with the inability to properly evaluate innovative electrical connections. Innovation in electrical connections is very slow because of the long life requirements, stringent fire safety requirements, long established conventional practices and evaluation procedures and lack of a performance base for describing requirements. The framework for a proposed method to evaluate electrical connections on a performance basis is presented along with supplementary information on current technology of electrical connections used in residential branch circuit wiring. GRA

N75-26280# Systems Control, Inc., Palo Alto, Calif.
COHERENCY BASED DYNAMIC EQUIVALENTS FOR TRANSIENT STABILITY STUDIES, PHASE 2 Final Report
Robert W. deMello, Robin Podmore, and K. Neil Stanton Dec. 1974 180 p refs
(PB-240797/1; EPRI-904) Avail: NTIS HC $7.00 CSCL 09C

An investigation of equivalent construction on the basis of identifying and grouping generators in the external network that behave coherently during a transient is reported. This approach was applied to a system having approximately 1000 buses and 2500 lines in an attempt to generate equivalents for the external system connected to the lower peninsula of Michigan. Initial results reducing the number of buses by about one-half and the number of lines by about one-third indicate that use of the equivalents reduces simulation times by factors of three-and-one-half to four. GRA

N75-26171 Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF ELECTRONICALLY TUNABLE ANALYZERS AND FILTERS
M. D. Genkin, V. S. Golubev, and A. I. Orlov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 64-85 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 107-123
(For availability see N75-26164 17-31)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N75-26281 British Library Lending Div., Boston Spa (England).
SPECIAL PROBLEMS OF NOISE REDUCTION IN POWER STATION AIR AND STEAM LINES

G. DeLank 9 Dec. 1974 16 p refs Transl. into ENGLISH from VGB Conf. on Power Stations and the Environment, Essen, (27-28 Feb. 1973), Session C, Paper 6
(BLL-CE-Trans-6514-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The problem of reducing the noise caused by air, gas, or steam flows in power stations was investigated. Topics discussed include acoustic power levels, noise attenuation, noise levels, flow rates, fresh-air fans, noise generation, and steam blow-off pipes. M.J.S.

N75-26282* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLUID CONTROL APPARATUS AND METHOD Patent
Charles W. McKee, inventor (to NASA) Issued 10 Jun. 1975 5 p Filed 30 Nov. 1973 Supersedes N74-29652 (12-19, p 2268)
(NASA-Case-LAR-11110-1; US-Patent-3,888,410; US-Patent-Appl-SN-420424; US-Patent-Class-233-6; US-Patent-Class-233-20RP; US-Patent-Class-233-25; US-Patent-Class-233-46; US-Patent-Class-233-DIG.1) Avail: US Patent Office CSCL 20D

A container for controlling and separating fluids and gases without using seals between movable parts is disclosed. The method works by placing the container in orbit about a circular path and holding it at a fixed orientation; the orientation coupled with the orbiting, cause the liquids and gases present to separate even when in a zero gravity environment. Flexible conduits provide for flow of liquids or gases to and from the interior of the container.
Official Gazette of the U.S. Patent Office

N75-26283 Minnesota Univ., Minneapolis.
THE FLUID MECHANICS OF COATING FLOWS Ph.D. Thesis
Kenneth John Ruschak 1974 218 p
Avail: Univ. Microfilms Order No. 75-12197

Coating flows, which are viscous free surface flows, were investigated to obtain analytic results for selected prototypes of actual coating processes. Regular and singular perturbation methods were used. The boundary conditions applicable at a free surface for an incompressible Newtonian fluid are derived for a general orthogonal coordinate system. The radial flow of a liquid down an inclined plane is analyzed as an example of a free surface problem which can be solved in its entirety. Limiting cases were investigated in prototype flows for several coating processes, and the rimming flow inside a rotating, horizontal cylinder was studied with a regular perturbation method. A prototype flow for slot coating is analyzed in the double limit of low coating speed and high surface tension, and dip coating was studied in the limit of low withdrawal speed and large surface tension both with gravity and without gravity.
Dissert. Abstr.

N75-26284 Illinois Univ., Urbana.
AEROSOL DEPOSITION IN A TURBULENT FLAT BOUNDARY LAYER Ph.D. Thesis
James Burroughs Wedding 1974 245 p
Avail: Univ. Microfilms Order No. 75-11771

Diffusion induced deposition of particles was investigated in a turbulent flat plate boundary layer. This was to determine the retention probability of a particle on the surface, the deposition rate, the density profiles and density gradients of the particle phase in the boundary layer, the particle diffusivity, the mass transfer coefficient (K), and to compare the results to pipe flow data. Deposition studies were performed on plant leaves with wide extremes of surface characteristics. The purpose was to establish the mass transfer coefficient (K) and the functional form describing deposition for deposition rate versus surface area for single leaves and arrays of leaves. A model was developed to numerically solve the particle diffusion equation utilizing the Crank-Nicolson algorithm. The results yield a series of plots of dimensionless particle cloud concentration versus a dimensionless boundary layer depth. A family of curves were generated at specified intervals of the flat plate for various turbulent Schmidt numbers based upon kinematic viscosity. Dissert. Abstr.

N75-26285 Illinois Univ., Urbana.
THE EFFECT OF DRAG REDUCING POLYMERS ON TURBULENT MASS TRANSFER Ph.D. Thesis
George Aloysius McConaghy 1974 227 p
Avail: Univ. Microfilms Order No. 75-11562

Mass transfer and drag reduction in turbulent flow of dilute solutions of Separan AP-30, a high molecular weight polyacrylamide, are examined. An electrochemical technique is employed to measure experimentally the time averaged value and fluctuations in the rate of mass transfer to the wall of a one inch diameter pipe. The electrochemical reaction used in this study is the diffusion limited cathodic reduction of tri-iodide ions in a potassium iodide electrolyte. The average mass transfer rate in polymer solutions is observed to be greatly reduced in comparison to that in the electrolyte solvent. This reduction is caused by two factors. First of all, it is observed that turbulent eddy mass transport is diminished in the wall region in polymer solutions. The physical properties of the polymer solution also differ from those of the solvent, causing the Schmidt number to increase from 700 to as high as 1250. Dissert. Abstr.

N75-26286 Colorado Univ., Boulder.
WAKE COLLAPSE IN A STRATIFIED FLUID: THE LINEAR INTERNAL WAVE GENERATION PROBLEM Ph.D. Thesis
Carlton Louis Hindman 1974 95 p
Avail: Univ. Microfilms Order No. 75-13432

The gravitational collapse of a cylindrical mixing region in a stratified fluid was studied from the standpoint of a linear theory. Difficulties found in the near-field results of previous work are shown to be a consequence of the use of an inviscid treatment of the initial value problem with an initial density discontinuity at the mixing region boundary. Inclusion of viscous effects results in the suppression of this behavior. The effect of viscosity on the internal wave generation features of the solution is shown to be negligible at scales of motion for which the ratio of viscous to buoyant forces is small. The calculation of the far-field internal wave pattern was carried out for a collapsing wake in bounded stratification. The problem is shown to be a straightforward generalization of the Cauchy-Poisson problem of surface gravity wave theory. Dissert. Abstr.

N75-26287 Pittsburgh Univ., Pa.
GENERALIZED TURBULENT CHANNEL FLOWS Ph.D. Thesis
Samandar M. Hai 1974 159 p
Avail: Univ. Microfilms Order No. 75-13646

Generalized turbulent channel flows, i.e., turbulent flows occurring in channels one wall of which is in motion are discussed. The equations of motion are transformed into vorticity and stream function equations which describe the flow behavior in a general two-dimensional coordinate system. Four turbulence models of viscosity were chosen for this investigation because of their simplicity and width of applicability. These models are incorporated into the transformed form of the equations of motion, and the resulting system is solved by an iterative finite-cell technique. This solution procedure is embodied in a computer program which was used to predict the velocity profiles of four types of flow in channels. They are fully-developed turbulent pressure flow, fully-developed laminar pressure flow, generalized laminar entrance flow, and generalized turbulent entrance flow. These predicted profiles are compared with three independent sets of experimental data in order to test the four turbulence models chosen. Dissert. Abstr.

N75-26288 Pittsburgh Univ., Pa.
HEAT TRANSFER AND FRICTION FACTORS OF HIGH PRANDTL NUMBER LAMINAR FLOW THROUGH AN ANNULUS WITH CIRCUMFERENTIAL FINS Ph.D. Thesis
Santosh Kumar Mandal 1974 231 p
Avail: Univ. Microfilms Order No. 75-13647

For the experimental investigation, three different fin heights and fins of both conductive and nonconductive material were used. The outer tube of the annulus was insulated while constant heat was supplied from the inside to the inner tube. The inner tube had circumferential fins on its outside surface. It was observed that heat transfer increased with the increase in the number of fins and with increasing Reynolds numbers. Friction factors decreased with increase in Reynolds number and increased with

the increase in number of fins. For the numerical investigation, the continuity, momentum, and energy equations were written in terms of vorticity, stream function, and temperature and converted to finite difference form. Two models were used in an effort to obtain the solution, but the results obtained were not completely satisfactory. It was observed that the results were dependent on the vorticity at the fin tip. The inlet and outlet velocity profiles which varied with the gap between the fin tip and outer tube could not be determined with any precision.
Dissert. Abstr.

N75-26289 Illinois Inst. of Tech., Chicago.
NUMERIKAL COMPUTATION OF THE STABILITY OF PLANE POISEUILLE FLOW Ph.D. Thesis
Ludwig Wolf, Jr. 1974 133 p
Avail: Univ. Microfilms Order No. 75-12822

The hydrodynamic stability of plane Poiseuille flow to infinitesimal and finite amplitude disturbances was investigated using a direct numerical technique. The vorticity and stream function equations are transformed in the transverse coordinate and are expressed in finite difference form. Second-order central differences in time and space with the DuFort-Frankel approximation of the diffusion terms were employed to integrate the vorticity equation. The stream function equation is solved by the method of successive over-relaxation. The vorticity equation was treated in a manner that conserves vorticity, and periodic averaging was employed to eliminate the weak instability associated with central time differences. Computations performed with large amplitude disturbances at both high and low wave numbers indicate the existence of an equilibrium disturbance amplitude which is a function of Reynolds number. Dissert. Abstr.

N75-26290 Virginia Polytechnic Inst. and State Univ., Blacksburg.
ANALYTIC INVESTIGATION OF TRANSONIC SHOCK BOUNDARY LAYER INTERACTION Ph.D. Thesis
William Henry Mason 1975 275 p
Avail: Univ. Microfilms Order No. 75-11945

The Navier-Stokes equations were thoroughly investigated through the use of perturbation methods and a generalized multi-region model was proposed for interactions between normal shock waves and turbulent boundary layers. The model is applied to a highly idealized case in which a uniform subsonic flow is used to model the boundary layer, and analytic results for the wall and interface pressure are obtained. In particular, the decay of the downstream interaction to its final pressure is found to be a very slow algebraic type decay typical of experimental results. The general model is then simplified and applied to a turbulent boundary layer interaction, and all of the essential experimental features of the interaction are found in the analytic results, including wall and boundary layer edge pressures, boundary layer growth, and the upstream skin friction disturbances.
Dissert. Abstr.

N75-26291 Stanford Univ., Calif.
INVESTIGATION OF SIMULTANEOUS MEASUREMENT OF PARTICLE SIZE AND VELOCITY IN A GAS-PARTICLE TWO-PHASE FLOW USING A LASER-DOPPLER VELOCIMETER Ph.D. Thesis
Dana Gene Andrews 1975 82 p
Avail: Univ. Microfilms Order No. 75-13478

Measurement of the Doppler frequency shift of focused laser light offers a powerful nonperturbing technique for probing various fluid flows. In principle, Dopplermeters can yield information on the average velocity and the turbulent velocity spectrum of scattering centers, which are small particles, either naturally occurring or deliberately added to the flow. Existing laser-Doppler velocimeters utilize light scattered by the particles to determine the velocity and concentration of the particles. Solid or liquid particles in the size range 1-10 microns satisfy the two conditions above for all but rapidly accelerating flow, and a single particle will give a detectable signal from continuous wave lasers operated at modest power. In a rapidly accelerating flow such as is found in a rocket nozzle or across a shock wave, the particle lag or slip can be appreciable and varies with particle size and mass. To determine the characteristics of such a flow the particle's size as well as velocity must be measured. Dissert. Abstr.

N75-26292 Stanford Univ., Calif.
AN EXPERIMENTAL STUDY OF THE STRUCTURE AND ACOUSTIC FIELD OF A JET IN A CROSS STREAM Ph.D. Thesis
Ivan de Azevedo Camelier 1975 135 p
Avail: Univ. Microfilms Order No. 75-13493

In order to understand the noise generated and radiated by a high speed circular jet issuing normally into an otherwise uniform stream, such as in the case of V/STOL aircraft, experimental studies were carried out in 7 x 10 foot wind tunnel. The jet is 1.5 inches in diameter and is operated at a fixed Mach number equal to .58. The tunnel velocity is changed to vary the ratio of the speed of the jet to that of the uniform stream in the range from 3.7 to 9.4. Measurements for zero crossflow were also included. A survey of the plane of symmetry of the jet was performed to measure the mean and turbulent velocity fields by using constant temperature hot wire anemometry. The intensity of the noise radiated from the jet was determined in the tunnel test section by utilizing the cross-correlation at a particular time delay between the signals of two microphones suitably located along a given direction. Dissert. Abstr.

N75-26293 New York Univ., N.Y. School of Engineering and Science.
AN EXPERIMENTAL INVESTIGATION OF INDUCED AND AMBIENT PRESSURE FLUCTUATIONS IN SUPERSONIC JET FLOWS Ph.D. Thesis
Vincent Barra 1974 114 p
Avail: Univ. Microfilms Order No. 75-12460

The ambient static pressure fluctuations and induced acoustic fields in cold supersonic jet flows are investigated. The jets, one a shock-free (balanced) flow with M sub j = 2 and the other an overexpanded flow with M sub j = 1.8, both exhaust from a 7 inch exit diameter nozzle. The overall level and spectral distribution of the static pressure fluctuations at selected points along the centerline of both flows are obtained. The shock structure present in the core of the overexpanded jet is seen to be responsible for several significant differences between the fluctuations in the two flows. The static pressure fluctuations along the centerline of the overexpanded jet are higher than those in the balanced jet due to an intensification of low frequency disturbances by this shock structure. A procedure is developed for tracing the propagation of externally induced periodic pressure disturbances inside the jet flows. An ensemble averaging technique is utilized to separate (or recover) the induced disturbances from the high-level random pressure fluctuations in the flows. The fields created within the two jet flows by a single acoustic disturbance (located at the periphery of the flows) are partially mapped clearly exhibiting supersonic convection. Dissert. Abstr.

N75-26294 Minnesota Univ., Minneapolis.
GRADIENT COALESCENCE: THIN LIQUID FILM MECHANICS AND STABILITY Ph.D. Thesis
Paul Allen Good 1974 224 p
Avail: Univ. Microfilms Order No. 75-12191

Mechanics and stability of free thin liquid films associated with droplet-droplet collisions were investigated. The view of coalescence adopted was that a film of continuous phase material trapped between drops during collision must thin until the film becomes spontaneously unstable, ruptures and droplet merger commences. Film thinning was found to be strongly dependent on degree of retardation of tangential interfacial velocity. Criteria for film rupture were also found to be a function of interface retardation. It was predicted that thin films are destabilized for sufficiently small interfacial retardation. Film thinning mechanics and stability criteria were combined to generate predictions of coalescence for collisions between equal sized drops in a shear field. Results were found to be a strong function of interface retardation. Dissert. Abstr.

N75-26295 Minnesota Univ., Minneapolis.
THE FLUID MECHANICS OF THE EDGETONE Ph.D. Thesis
David Kermit Holger 1974 149 p
Avail: Univ. Microfilms Order No. 75-12080

The characteristics were investigated of the asymmetric vortex street which is formed from a two-dimensional jet by using conservation equations of fluid mechanics. A hydrodynamic model

for the street-edge interaction was used, and an analysis of that interaction was conducted using two-dimensional potential flow theory. The feedback mechanism from the street-edge interaction to the jet origin is analyzed numerically using a hydrodynamic model to obtain phase information. Flow visualization results are presented, and compared with the theoretical predictions of the vortex street characteristics. Experimental measurements of the acoustic pressure field are presented for the operating edgetone. Experimental results together with results from the literature indicate that the proposed theory is capable of predicting the operating frequency and sound pressure amplitude of the edgetone. Dissert. Abstr.

N75-26296 Virginia Polytechnic Inst. and State Univ., Blacksburg.
KINETIC THEORY OF PISTON PROBLEM AND THERMAL DISTURBANCE BY THE ELLIPSOIDAL STATISTICAL MODEL Ph.D. Thesis
Pin-min Chen 1975 123 p
Avail: Univ. Microfilms Order No. 75-11937

The formation of shock waves by a moving piston and the thermal disturbance of a fixed wall by sudden temperature change are studied according to the kinetic theory of gases. The ellipsoidal statistical model which gives the correct Prandtl number for a monatomic gas is solved numerically. The perturbation method proposed by Chu is applied. Velocity, density, temperature, and pressure distributions are calculated at each time step for various piston speeds for the piston problem. A comparison between the Bhatnager-Gross-Krook model solution and the ellipsoidal statistical model solution is made. The thermal disturbances of velocity, density, and temperature are calculated at each time step for various wall temperatures. A comparison between the Kovitz-Heilman solutions and the ellipsoidal model is made. Dissert. Abstr.

N75-26297 Polish Academy of Sciences, Warsaw.
POLSELLE FLOW IN CHANNELS WITH PARALLEL RODS [PRZEPLYW TYPU POLSEULLE'A W KANALACH Z ROWNOLEGLYMI PRETAMI]
Jan Adam Kolodziej 9 Jan. 1975 22 p refs In POLISH
Avail: Issuing Activity

Viscous incompressible fluid flow along a system of thin cylindrical rods located in channels is described. Equations are derived which satisfy the boundary conditions of the channel walls and the rods. Transl. by M.J.S.

N75-26298 Polish Academy of Sciences, Warsaw.
PULSED DOPPLER BLOOD FLOWMETER. AN ANALYSIS OF THE FLOW MEASUREMENTS MADE BY THE CONTINUOUS DOPPLER METHOD [IMPULSOWY DOPPLEROWSKI MIERNIK PRZEPLYWU KRWI. OCENA POMIARU PRZEPLYWU CIAGLA METODA DOPPLEROWSKA]
A. Nowicki, K. Borodzinski, and T. Powalowski 12 Dec. 1974 22 p refs In POLISH
Avail: Issuing Activity

Results are presented which indicate that the ultrasonic pulsed Doppler method of measuring blood flow in vivo can be used in clinical investigations of blood vessels or in analysis of the heart. The flowmeter is described along with the experimental results of using it. The influence was investigated of the dependence between the width of the ultrasonic bundle and the diameter of the vessel on the results of measuring flow using the Doppler ultrasonic method. Transl. by M.J.S.

N75-26299 Polish Academy of Sciences, Warsaw.
A PARTICULAR CLASS OF POTENTIAL THREE DIMENSIONAL GAS FLOWS IN CHANNELS WITH DEVELOPING WALLS [O PEWNEJ KLASIE POTENCJALNYCH TROJWYMIAROWYCH PRZEPLYWOW GAZU W KANALACH Z ROZWIJALNYMI SCIANKAMI]
Marek Burnat 30 Nov. 1974 37 p refs In POLISH
Avail: Issuing Activity

The possibility was examined of solving multidimensional boundary value problems of gas dynamics using the plane wave interaction method. Other topics discussed include partial differential equations, vector analysis, numerical analysis, and nonlinear systems. Transl. by M.J.S.

N75-26300 New Jersey Inst. of Technology, Newark.
A NONLINEAR VISCOELASTIC MODEL Ph.D. Thesis
Yon-Li Shangkuan 1974 109 p
Avail: Univ. Microfilms Order No. 75-12796

A nonlinear viscoelastic model was developed to describe the non-Newtonian viscosities and the primary normal stress differences of high polymers at steady state shearing flow. It was demonstrated that the Huang-Shangkuan model gives the best representation of the experimental data for a wide range of shear rates. In the high shear rate region the Huang-Shangkuan model is distinguished among other models by its capability to predict the non-Newtonian viscosities and the primary normal stress differences which the other models fail to predict. Continuum mechanics, Lodge's network theory and Rouse's theory provides specific information in developing the model. The theoretical aspect of this model is also supported by the experimental data, which were taken using the accurate Weissenberg rheogoniometer. Dissert. Abstr.

N75-26301 Stanford Univ., Calif.
THREE DIMENSIONAL SIMULATION OF THERMALLY INFLUENCED HYDRODYNAMIC FLOWS Ph.D. Thesis
Lynn Dickson Spraggs 1975 309 p
Avail: Univ. Microfilms Order No. 75-13603

A study was undertaken to develop a three-dimensional numerical model for prediction of the temperature regime and energy transfers in bodies of water subjected to thermal loadings. A time dependent, spatially variant, three-dimensional numerical model which simulates the hydrodynamics and thermal regime of bodies of water with external heat sources is developed. The Navier-Stokes equations, a heat energy equation, a pressure equation, and a continuity equation are non-dimensionalized using three characteristic length scales. The boussinesq approximation is used to restrict density variations to the gravitational term of the third momentum equation. Finally, sub-grid-scale turbulence simulation is used with an eddy viscosity hypothesis. Calculated eddy viscosity values for a large rectangular basin are in agreement with experimental values. Dissert. Abstr.

N75-26302*# Southern Univ., Baton Rouge, La. Dept. of Physics.
SHOCK WAVE STRUCTURE IN AN IDEAL DISSOCIATING GAS Annual Progress Report
K. H. Liu [1975] 47 p refs
(Grant NGR-19-005-003)
(NASA-CR-142985) Avail: NTIS HC $3.75 CSCL 20D

Composition changes within the shock layer due to chemical reactions are considered. The Lighthill ideal dissociating gas model was used in an effort to describe the oxygen type molecule. First, the two limiting cases, when the chemical reaction rates are very slow and very fast in comparison to local convective rates, are investigated. Then, the problem is solved for arbitrary chemical reaction rates. Author

N75-26303*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METAL TEMPERATURES AND COOLANT FLOW IN A WIRE CLOTH TRANSPIRATION COOLED TURBINE VANE
Herbert J. Gladden Washington Jun. 1975 23 p refs
(NASA-TM-X-3248; E-8249) Avail: NTIS HC $3.25 CSCL 21E

An experimental heat transfer investigation was conducted on an air-cooled turbine vane made from wire-wound cloth material and supported by a central strut. Vane temperature data obtained are compared with temperature data from two full-coverage film-cooled vanes made of different laminated construction. Measured porous-airfoil temperatures are compared with predicted temperatures. Author

N75-26304*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON UNDER A SIMULATED SUN OF TWO BLACK-NICKEL-COATED FLAT-PLATE SOLAR COLLECTORS WITH A NONSELECTIVE BLACK-PAINT-COATED COLLECTOR
Frederick F. Simon Washington Jun. 1975 23 p refs
(NASA-TM-X-3226; E-8236) Avail: NTIS HC $3.25 CSCL 10A

A performance evaluation was made of two, black nickel coated, flat plate solar collectors. Collector performance was determined under a simulated sun for a wide range of inlet temperatures, including the temperature required for solar powered absorption air conditioning. For a basis of comparison a performance test was made on a traditional, two glass, nonselective, black paint coated, flat plate collector. Performance curves and performance parameters are presented to point out the importance of the design variables which determine an efficient collector. A black nickel coated collector was found to be a good performer at the conditions expected for solar powered absorption air conditioning. This collector attained a thermal efficiency of 50 percent at an inlet temperature of 366 K (200 F) and an incident flux of 946 watts/sq m (300 Btu/hr-sq ft). Author

N75-26305*# Boston Univ., Mass. Dept. of Aerospace Engineering.

SUSSA ACTS: A COMPUTER PROGRAM FOR STEADY AND UNSTEADY, SUBSONIC AND SUPERSONIC AERODYNAMICS FOR AEROSPACE COMPLEX TRANSPORTATION SYSTEMS

KaDin Tseng and Luigi Morino [1974] 13 p refs
(Grant NGR-22-004-030)
(NASA-CR-142978) Avail: NTIS HC $3.25 CSCL 20D

The computer program SUSSA ACTS (Steady and Unsteady, Subsonic and Supersonic Aerodynamics for Complex Transportation Systems) are presented in the final version. The numerical formulation and the description of the program and numerical results are included. In particular, generalized forces for fully unsteady (complex frequency) aerodynamics for a wing-body configuration, in both subsonic and supersonic flows, are discussed. The mathematical analysis includes completely arbitrary motion. The numerical implementation was limited to steady and oscillatory flows. A more general aerodynamic formulation in the form of a fully transient response for time-domain analysis and the aerodynamic transfer function (Laplace transform of the fully unsteady operator) for frequency-domain analysis is outlined. Author

N75-26306*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRESSURE DISTRIBUTION IN A CONVERGING-DIVERGING NOZZLE DURING TWO-PHASE CHOKED FLOW OF SUBCOOLED NITROGEN

Robert J. Simoneau 1975 12 p refs To be presented at the Winter Ann. Meeting of the Am. Soc. of Mech. Engr., Houston, 30 Nov. - 5 Dec. 1975
(NASA-TM-X-71762; E-8415) Avail: NTIS HC $3.25 CSCL 20D

Choked flow rates and axial pressure distributions were measured for subcooled nitrogen in a converging-diverging nozzle with a constant area section in the throat region. Stagnation pressures ranged from slightly above saturation to twice the thermodynamic critical pressure. Stagnation temperatures ranged from 0.75 to 1.03 times the thermodynamic critical temperature. The choking plane is at the divergence end of the constant area throat section. At high stagnation pressures the fluid stays liquid well into the constant area throat region; at near saturation stagnation pressures it appears that vaporization occurs at or before the entrance to the constant area throat region. The throat-to-stagnation pressure ratio data exhibits an anomalous flat region, and this anomaly is related to the two-phase process. The fluid is metastably all liquid below the saturation pressure. Author

N75-26307*# Avco Corp., Wilmington, Mass.

THE NATA CODE: THEORY AND ANALYSIS, VOLUME 1 Final Report

W. L. Bade and J. M. Yos Washington NASA Jun. 1975 230 p refs
(Contract NAS9-9744)
(NASA-CR-2547; AVSD-0288-74-RR) Avail: NTIS HC $7.50 CSCL 20D

A computer program for calculating quasi-one-dimensional gas flow in axisymmetric and two-dimensional nozzles and rectangular channels is presented. Flow is assumed to start from a state of thermochemical equilibrium at a high temperature in an upstream reservoir. The program provides solutions based on frozen chemistry, chemical equilibrium, and nonequilibrium flow with finite reaction rates. Electronic nonequilibrium effects can be included using a two-temperature model. An approximate laminar boundary layer calculation is given for the shear and heat flux on the nozzle wall. Boundary layer displacement effects on the inviscid flow are considered also. Chemical equilibrium and transport property calculations are provided by subroutines. The code contains precoded thermochemical, chemical kinetic, and transport cross section data for high-temperature air, CO2-N2-Ar mixtures, helium, and argon. It provides calculations of the stagnation conditions on axisymmetric or two-dimensional models, and of the conditions on the flat surface of a blunt wedge. The primary purpose of the code is to describe the flow conditions and test conditions in electric arc heated wind tunnels. Author

N75-26308# National Aeronautical Establishment, Ottawa (Ontario).

THE SPREADING OF A LIQUID DROP ON A PLANE SOLID

A. M. Drummond Jan. 1975 27 p refs
(LR-583; NRC-14579) Avail: NTIS HC $3.75

The theoretical spread factor analysis was experimentally verified for drops less than about 450 microns. For larger drops, the spread factor is larger than that theoretically predicted which implies a smaller contact angle for larger drops. Perhaps the receding contact angle is smaller than the advancing contact angle for large drops and may be the dominant cause of the discrepancy. The generation of large drops of uniform size by cyclic jet perturbation is very easy but drop spectrum distortion due to coalescence for small diameter jets (small drops) rules out the technique used in these experiments as a practical method for producing sprays with a narrow droplet size spectrum. Author

N75-26309*# Calspan Corp., Buffalo, N.Y.

EXPERIMENTAL AND THEORETICAL STUDY OF SHUTTLE LEE-SIDE HEAT TRANSFER RATES

G. K. Mruk, J. Bertin, and J. P. Lamb Mar. 1975 203 p refs
(Contract NAS9-13707)
(NASA-CR-141890; ZC-5403-A-1) Avail: NTIS HC $7.25 CSCL 20D

The experimental program which was conducted in the Calspan 96-inch hypersonic shock tunnel to investigate what effect the windward surface temperature had on the heat transfer to the leeward surface of the space shuttle orbiter is discussed. Heat-transfer distributions, surface-pressure distributions, and schlieren photographs were obtained for an 0.01-scale model of the 139 configuration space shuttle orbiter at angles-of-attack of 30 and 40 deg. Similar data were obtained for an 0.01 scale wingless model of the 139 configuration at angles-of-attack of 30 and 90 deg. Data were obtained for Mach numbers from Reynolds numbers, and surface temperatures and compared with theoretical results. Author

N75-26310*# Hamilton Standard, Windsor Locks, Conn.

LIGHTWEIGHT LONG LIFE HEAT EXCHANGER Final Report, 1 Jul. 1973 - 30 Apr. 1975

Earl K. Moore Apr. 1975 179 p
(Contract NAS9-13552)
(NASA-CR-141873; SVHSER-6534) Avail: NTIS HC $7.00 CSCL 20M

The design, fabrication, and evaluation of a full scale shuttle-type condensing heat exchanger constructed of aluminum and utilizing aluminum clad titanium parting sheets is described. A long term salt spray test of candidate parting sheet specimens is described. The results of an investigation into an alternate method of making composite sheet material are discussed. Author

N75-26311*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

INDUCED PRESSURE DISTRIBUTION OF A JET IN A CROSSFLOW

Richard L. Fearn and Robert P. Weston Washington Jul. 1975 105 p refs
(NASA-TN-D-7916; L-9894) Avail: NTIS HC $5.25 CSCL 20D

The turbulent flow of a subsonic round jet exhausting perpendicularly from a flat plate into a subsonic crosswind of the same temperature was investigated in the Langley V/STOL tunnel. The large test section of this tunnel made it possible to use a jet with the relatively large diameter of 10.16 cm. Pressures were measured on the flat plate at over 400 locations to provide a detailed description of the static pressure distribution. Results are presented in tabular and graphical forms for jet to crossflow velocity ratios ranging from 2 to 10, and comparisons are made with results of other experiments. The results indicate that the dominant flow parameter affecting the pressure distributions is the ratio of jet to crossflow velocities. The distribution of turbulence on the plate also appears to be a function of velocity ratio. Author

N75-26312*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECT OF INITIAL FLOW NONUNIFORMITY ON SECOND-STAGE FUEL INJECTION AND COMBUSTION IN A SUPERSONIC DUCT
Wm. Roger Russin Jun. 1975 52 p refs
(NASA-TM-X-72667) Avail: NTIS HC $4.25 CSCL 20D

The effects of flow nonuniformity on second-stage hydrogen fuel injection and combustion in supersonic flow were evaluated. The first case, second-stage fuel injection into a uniform duct flow, produced data indicating that fuel mixing is considerably slower than estimates based on an empirical mixing correlation. The second-case, two-stage fuel injection (or second-stage fuel injection into a nonuniform duct flow), produced a large interaction between stages with extensive flow separation. For this case the measured wall pressure, heat transfer, and amount of reaction at the duct exit were significantly greater than estimates based on the mixing correlation. Substantially more second-stage fuel burned in the second case than in the first case. Overall effects of unmixedness/chemical kinetics were found not to be significant at the exit for stoichiometric fuel injection. Author

N75-26313*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SLIP CONDITIONS WITH WALL CATALYSIS AND RADIATION FOR MULTICOMPONENT, NONEQUILIBRIUM GAS FLOW
William L. Hendricks (Natl. Academy of Sciences - Natl. Res. Council) Jun. 1974 34 p refs
(NASA-TM-X-64942) Avail: NTIS HC $3.75 CSCL 20D

The slip conditions for a multicomponent mixture with diffusion, wall-catalyzed atom recombination and thermal radiation are derived, and simplified expressions for engineering applications are presented. The gas mixture may be in chemical nonequilibrium with finite-rate catalytic recombination occurring on the wall. These boundary conditions, which are used for rarefied flow regime flow field calculations, are shown to be necessary for accurate predictions of skin friction and heat transfer coefficients in the rarefied portion of the space shuttle trajectory. Author

N75-26314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MAXIMUM TWO-PHASE FLOW RATES OF SUBCOOLED NITROGEN THROUGH A SHARP-EDGED ORIFICE
Robert J. Simoneau 1975 22 p refs Presented at Cryog. Eng. Conf., Kingston, Ontario, 22-25 Jul. 1975
(NASA-TM-X-71760) Avail: NTIS HC $3.25 CSCL 20D

Data are presented of an experiment in which subcooled liquid nitrogen was discharged through a sharp-edged orifice at flow rates near the maximum. .The data covered a range of inlet stagnation pressures from slightly above saturation to twice the thermodynamic critical pressure. The data were taken along five separate inlet stagnation isotherms ranging from 0.75 to 1.035 times the thermodynamic critical temperature. The results indicate that subcooled liquids do not choke or approach maximum flow in an asymptotic manner even though the back pressure is well below saturation; and orifice flow coefficients are not constant as is frequently assumed. A metastable jet appears to exist which breaks down if the difference between back pressure and saturation pressure is large enough. Author

N75-26315*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID NEON HEAT TRANSFER AS APPLIED TO A 30 TESLA CRYOMAGNET
S. S. Papell and R. C. Hendricks 1975 8 p refs Presented at Cryog. Eng. Conf., Kingston, Ontario, 22-25 Jul. 1975
(NASA-TM-X-71712; E-8330) Avail: NTIS HC $3.25 CSCL 20M

A 30-tesla magnet design is studied which calls for forced convection liquid neon heat transfer in small coolant channels. The design also requires suppressing boiling by subjecting the fluid to high pressures through use of magnet coils enclosed in a pressure vessel which is maintained at the critical pressure of liquid neon. This high pressure reduces the possibility of the system flow instabilities which may occur at low pressures. The forced convection heat transfer data presented were obtained by using a blowdown technique to force the fluid to flow vertically through a resistance heated, instrumented tube. Author

N75-26316*# National Center for Atmospheric Research, Boulder, Colo.
THE VORTEX STREET AS A STATISTICAL-MECHANICAL PHENOMENON
David Montgomery Jun. 1974 10 p refs Submitted for publication Sponsored in part by NSF
(Grant NGL-16-001-043)
(NASA-CR-143060) Avail: NTIS HC $3.25 CSCL 20D

An explanation of the Karman vortex street is presented on the basis of the two-temperature canonical distribution for inviscid two-dimensional flows in Navier-Stokes fluids or guiding-center plasmas. Author

N75-26317# Illinois Univ., Urbana. Water Resources Center.
EXPERIMENTAL MEASUREMENTS OF PARTICLE MOTION IN A TURBULENT PIPE FLOW
Neil Mooers Howard 1974 220 p refs
(Contract DI-14-31-0001-3582)
(PB-239993/9; OWRT-B-067-ILL(1)) Avail: NTIS MF $7.25 CSCL 20D

An experimental study of the motion of single spherical particles in turbulent pipe flow at 50,000 Reynolds number has been conducted. The study consisted of four basic parts: (1) the extension of present particle theory valid for homogeneous flow into the realm of nonhomogeneous pipe flow; (2) measurements of two point spacetime correlations in the pipe to determine the fluid convected frame time macroscale; (3) experimental measurements of particle trajectories in the turbulent pipe flow; and (4) an evaluation of the errors involved in the experimental procedure and methods of data processing and smoothing. GRA

N75-26318# Oxford Univ. (England). Dept. of Engineering Science.
THE WATER CAVITATION TUNNEL: DESCRIPTION AND OPERATING PROCEDURES
A. B. Bailey [1974] 36 p
(OUEL-1083/74) Avail: NTIS HC $3.75

The Oxford University water cavitation tunnel comprises a closed hydraulic circuit with means for circulating the water at preselected speeds around the test body and for controlling the mean ambient pressure around the body. The features of the tunnel are described and the operating procedures, including maintenance and instrumentation, are detailed. ESRO

N75-26319# Oxford Univ. (England). Dept. of Engineering Science.
THERMODYNAMIC ASPECTS OF CAVITATION IN PUMPS. PART 2: THE OXFORD UNIVERSITY MULTI-FLUID HIGH TEMPERATURE CAVITATION TUNNEL. DESIGN AND CONSTRUCTIONAL FEATURES
M. E. P. Wykes [1974] 72 p refs
(Contract AT/1057/107/NEL)
(OUEL-1109/74) Avail: NTIS HC $4.25

Following a literature survey and analysis of the problem of the thermodynamic effect related to cavitation in pumps, the design of a multifluid cavitation tunnel for the investigation of the effect in incipient and developed cavitation is described. The major design parameters of the tunnel are established from considerations of the thermal properties of the prospective tests

fluids, and the designs of the major tunnel components and systems are described. Author (ESRO)

N75-26320# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
TWO-DIMENSIONAL FLOW FIELD OF AN AXISYMMETRIC LAVAL NOZZLE. PART 2: COMPUTER PROGRAM AND OPERATION INSTRUCTIONS [ZWEIDIMENSIONALES STROEMUNGSFELD EINER ACHSIALSYMMETRISCHEN LAVALDUESE. TEIL 2: RECHENPROGRAMM UND BEDIENUNGSANLEITUNG]
Robert H. Schmucker 1 May 1974 33 p ref In GERMAN (TUM-LRT-TB-20) Avail: NTIS HC $3.75

An ALGOL-60 computer program is described which is used to determine the isentropic flow of an ideal gas in an axisymmetric Laval nozzle. The program is based on the method of characteristics. ESRO

N75-26321# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE NUMERICAL SOLUTION OF THE ASYMPTOTIC EQUATIONS OF TRAILING EDGE FLOW Final Report, Jul. 1970 - Dec. 1973
Charles E. Jobe Oct. 1974 115 p refs
(AF Proj. 1476)
(AD-A003668; AFFDL-TR-74-46) Avail: NTIS CSCL 20/4

The report presents numerical analysis which provides additional validation for the triple-deck flow structure at the trailing edge of a flat plate; also, the constants required to complete the asymptotic expansions of Stewartson (1969) are determined. The results are self-consistent for the various grid sizes and numerical ranges employed for the computation. The present results have been demonstrated consistent with the previous numerical analyses of others and with the experimental data of Janour (1951) for the entire laminar range of Reynolds numbers. GRA

N75-26322# Barry Research Corp., Palo Alto, Calif.
BEYOND-THE-HORIZON VHF COMMUNICATION USING MAN-MADE IONOSPHERIC SCATTERERS Final Technical Report, May 1973 - Jul. 1974
Roy A. Sasselli and John F. McLaughlin Dec. 1974 82 p refs
(Contract F30602-73-C-0263; ARPA Order 2079; AF Proj. 2079)
(AD-A003641; RADC-TR-74-316) Avail: NTIS CSCL 17/2

The report summarizes the design of a communications circuit using the man-made ionospheric scatterers and the characteristics of VHF signals propagated over such a circuit. It represents a compilation of experimental data obtained during field exercises in which communications were established between terminals separated 1400 km and 2200 km. The scattering cloud was located 1000-1200 km from both transmitter and receiver terminals. The report summarizes the requirements of an ionospheric heater and describes the characteristics of the disturbance itself. These characteristics include observed radar cross section as a function of time of day, amount of heater radiated power, and heater modulation. GRA

N75-26323# Pennsylvania State Univ., University Park. Applied Research Lab.
ON THE INVESTIGATION OF CASCADE AND TURBOMACHINERY ROTOR WAKE CHARACTERISTICS Ph.D. Thesis
Rishi Raj Nov. 1974 206 p refs
(Contract N00017-73-C-1418)
(AD-A003580; TM-74-267) Avail: NTIS CSCL 21/5

The objective of the investigation reported in this thesis is to study the mean and turbulence characteristics of a turbomachinery rotor wake, both analytically and experimentally. The turbulence closure problem for the rotor wake in generalized tensors and non-inertial frame of reference is developed. Simplified solutions are obtained for the prediction of mean properties of the cascade and the rotor wake respectively as a function of the downstream distance from the trailing edge, pressure gradient and other parameters of the cascade and rotor geometry. GRA

N75-26324# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
THREE DIMENSIONAL DISTURBANCES IN TWO DIMENSIONAL REATTACHING FLOWS Interim Report
G. R. Inger Aug. 1974 63 p refs
(Grant AF-AFOSR-2173-72)
(AD-A003512; VPI-Aero-011; AFOSR-74-0610TR) Avail: NTIS CSCL 20/4

Two possible causes of the pronounced periodic spanwise disturbances that have been observed in nominally two-dimensional or axi-symmetric reattaching laminar and turbulent separated flows are studied theoretically. Approximate analytical compressible small disturbance flow models for both a local vortex instability mechanism and the effect of a row of incoming streamwise vortices are set up, solved and compared with available experimental data on surface disturbance pattern, pressure and heat transfer. The results on all counts confirm the predictions of the vortex instability model. GRA

N75-26325# Naval Undersea Center, San Diego, Calif.
RECENT PROGRESS IN POLYMER DRAG REDUCTION Research and Development Report, Jan. - Apr. 1974
J. W. Hoyt Oct. 1974 54 p refs
(NR Proj. 062-329)
(AD-A003941; NUC-TP-433) Avail: NTIS CSCL 20/4

Recent developments on various aspects of polymer friction reduction in turbulent flow are reviewed, with special emphasis on the areas where intensive work is currently under way. Detailed attention is paid to the topics of drag-reducing suspensions, heat transfer in polymer solutions, and the effect of polymers on cavitation, jets, and lift. GRA

N75-26326# Massachusetts Inst. of Tech., Cambridge.
PRESSURE PERTURBATIONS IN A THIN BOUNDARY LAYER OVER A DEFORMING SURFACE Interim Report
Marten T. Landahl and James I. Lerner 1974 39 p refs Prepared in cooperation with Stanford Univ., Calif.
(Contract F44620-71-C-0007; AF Proj. 6831; AF Proj. 9781)
(AD-A004519; AFOSR-75-0134TR) Avail: NTIS CSCL 20/4

For a thin turbulent boundary layer in incompressible flow over an oscillating surface the surface pressure will be dominated by the effect of the mean velocity distribution, the reason being that the perturbation viscous stresses and turbulent Reynolds stresses are important only within a very thin region near the surface. This permits the treatment of the boundary layer as an inviscid shear layer. An analytical expression for the oscillating surface pressure perturbation valid for oscillating deformations of a large scale compared to the shear layer thickness, is obtained by Fourier transformation in the streamwise variable. The extension to three-dimensional flow yields the result that the surface pressure operator has the same form as in the two-dimensional case. GRA

N75-26327# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
WAVE BREAKDOWN IN STRATIFIED SHEAR FLOWS Interim Report
M. T. Landahl and W. O. Criminale, Jr. (Washington Univ., Seattle) 1974 28 p refs Prepared in cooperation with Royal Inst. of Technology, Stockholm, Sweden
(Contract F44620-71-C-0007; AF Proj. 9781)
(AD-A004482; AFOSR-75-0188TR) Avail: NTIS

The wave mechanical condition (Landahl, 1972) for breakdown of an unsteady laminar flow into strong small-scale secondary instabilities is applied to some simple stratified inviscid shear flows. The flows considered have one or two discrete density interfaces and simple discontinuous or continuous velocity profiles. A primary wave-like disturbance of such a flow is observed to produce a perturbation velocity discontinuity at a density-interface which leads to local secondary shear-flow instability with a phase and group velocity equal to the mean instantaneous velocity across the interface. The disturbed flow then becomes critical according to the breakdown criterion whenever this velocity reaches a value equal to the phase velocity of the primary wave. Some calculations are discussed. GRA

N75-26328# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF HEAT TRANSFER IN THE PRESENCE OF INJECTION WITH THE AID OF A GRID CIRCUIT PACKAGE
V. L. Shchukin and N. S. Idiatullin 18 Nov. 1974 20 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (Kazan), no. 133, 1971 p 62-71
(AD-A004512; FTD-HC-23-1485-74) Avail: NTIS CSCL 20/13

The calculation relations for the heat transfer coefficient on an interior surface of a tube with gas injection into a turbulent boundary layer are obtained on the basis of experimental investigations. GRA

N75-26329# Naval Ship Research and Development Center, Bethesda, Md. Ship Acoustics Dept.
SOURCE DISTRIBUTION OF TURBULENT BURSTS DURING NATURAL TRANSITION Final Report
Theodore M. Farabee, Mario J. Casarella, and Fred C. DeMetz Aug. 1974 52 p refs
(SF43452702)
(AD-A003454; SAD-89E-1942) Avail: NTIS CSCL 20/4

The basic statistical properties of the wall pressure field associated with turbulent spots in a transition boundary layer have been measured on a large flat plate test fixture in the Anechoic Flow Facility at the Naval Ship Research and Development Center. The measured statistical properties and the distribution of the turbulent spots on the plate surface are compared with a quantitative formulation of the transition process which was developed by Emmons. This paper considers the consistency between the predicted and measured statistical burst properties when two simple forms of the source-rate density function are assumed. GRA

N75-26330# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
WAVE PROPAGATION AND CHOKING IN TWO PHASE TWO COMPONENT FLOW Ph.D. Thesis
Dennis R. Liles Dec. 1974 124 p refs
(Grant AF-AFOSR-1853-70; AF Proj. 9781)
(AD-A004397; AFOSR-75-0140TR) Avail: NTIS CSCL 20/4

The problem of wave propagation and choking has been examined analytically for gas-liquid flows. A drift-flux (mixture) model was employed and the solution was provided by the method of characteristics. Major advances were made towards development of a model which can predict the critical flux in two-component gas-liquid flows in conduits. The characteristics of the resulting set of equations were examined and compared with speed of sound data and conclusions were drawn between the conditions at the critical point and the speed of pressure pulses in the system. The main emphasis of the research was on two-component flows but some results applicable to one-component flows were also developed. GRA

N75-26331# Wisconsin Univ., Madison. Mathematics Research Center.
UNIFORM ASYMPTOTIC APPROXIMATION FOR VISCOUS FLUID FLOW DOWN AN INCLINED PLANE
S. M. Shih and M. C. Shen Nov. 1974 40 p refs
(Contract DA-ARO(D)-31-124-74-462 NSF GP-28699)
(AD-A003701; MRC-TSR-1456) Avail: NTIS CSCL 20/4

An asymptotic method is developed for the linearized Navier-Stokes equations governing the time-dependent motion of a viscous fluid flow down an inclined plane. A diffusion equation for the first order approximation of the fluid surface elevation in a perturbation scheme is derived and a critical Reynolds number is defined based upon the well-posedness of the equation. Under a set of sufficient conditions it is shown that the solution of the diffusion equation is a uniform asymptotic approximation to the generalized solution of the full equations for all time by means of various (L sub 2) and pointwise estimates. GRA

N75-26332# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
PROPAGATION OF SINUOUS DISTURBANCES IN TWO DIMENSIONAL AND CONFINED LAMINAR SUBMERGED JETS Final Report
F. T. Brown and R. C. Sekhar 31 Aug. 1974 23 p refs
(Contract DAHC04-70-C-0060)
(AD-A004018; Rept-441700-1; ARO-9533-1-E) Avail: NTIS CSCL 20/4

The dynamic response of laminar submerged two-dimensional and face-plate bounded jets to lateral disturbances is investigated. In particular, the propagation of sinous disturbances, including those generated from a oscillatorily pivoting origin such as approximated in analog fluidic amplifiers, is described largely in terms of the propagation velocity of the disturbances and the spacial growth rate of the envelope. Two-dimensional jets are analyzed over a broad range of Reynolds and Strouhal numbers both locally and globally. Jets with three-dimensional effects introduced by face plates are analyzed, with relatively less precision, for various aspect ratios. GRA

N75-26447 Joint Publications Research Service, Arlington, Va.
NUMERICAL SIMULATION OF TURBULENT EXCHANGE OF A TWO-PHASE STRATIFIED FLOW IN A CHANNEL
M. I. Zheleznyak *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 73-85 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 58-67
(For availability see N75-26441 17-42)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-26333 British Library Lending Div., Boston Spa (England).
DESIGN OF A FLAME PYROMETER BASED ON TELEVISION TECHNOLOGY
W. Hartel 9 Jul. 1974 23 p refs Transl. into ENGLISH from VGB Kraftwerkstechnik (West Germany), v. 53, no. 6, Jun. 1973 p 393-400
(BLL-CE-Trans-6357-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

By appropriate structuring of the flame on the basis of prior calculation, it is possible to reduce the environmental pollution caused by fuel gases. Two methods were studied for solving this problem: one method uses a mathematical model, while the other depends on improving the measuring methods used. Other topics discussed include black body radiation, electromagnetic radiation, television cameras, temperature imaging, color television, isothermal processes, and flame temperature. M.J.S.

N75-26334* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GAS CHROMATOGRAPH INJECTION SYSTEM Patent
Glenn E. Pollock, Milton E. Henderson, and Ralph W. Donaldson, Jr., inventors (to NASA) Issued 3 Jun. 1975 7 p Filed 27 Feb. 1974 Supersedes N74-20021 (12-11, p 1290)
(NASA-Case-ARC-10344-2; US-Patent-3,887,345; US-Patent-Appl-SN-446564; US-Patent-Class-55-386) Avail: US Patent Office CSCL 14B

An injection system for a gas chromatograph is described which uses a small injector chamber (available in various configurations). The sample is placed in the chamber while the chamber is not under pressure and is not heated, and there is no chance of leakage caused by either pressure or heat. It is injected into the apparatus by changing the position of a valve and heating the chamber, and is volatilized and swept by a carrier gas into the analysis apparatus.
Official Gazette of the U.S. Patent Office

N75-26335 Miami Univ., Coral Gables, Fla.
INFORMATION THEORY APPLIED TO THE MEASUREMENT OF LINE SHAPES WITH THE FABRY-PEROT INTERFEROMETER Ph.D. Thesis
Alain William Wouters 1974 195 p
Avail: Univ. Microfilms Order No. 75-12871

In the use of spectroscopy as a plasma diagnostic tool, consideration is given to the limitations on the transfer of information from the plasma to the instrument. The computation of signal to noise ratio as a function of resolution is fundamental to this approach and must be developed in a uniform manner for the largest range of situations. This is done for linear systems. The result appears in modular form as efficiency as a function of resolution for each component of the system. The sensing of a spectrum, the grating spectrograph, the Fabry-Perot interferometer and the photographic film are explicitly studied. When combined as in a photographic Fabry-Perot, these computations result in a set of relations useful either for the design of the instrument or the analysis of the data. They are then applied to actual observations of artificial barium clouds in the ionosphere and the solar corona during eclipses.
Dissert. Abstr.

N75-26336*# Rockwell International Corp., Anaheim, Calif. Electronic Research Div.
INVESTIGATION OF SYSTEM INTEGRATION METHODS FOR BUBBLE DOMAIN FLIGHT RECORDERS Final Report, 7 Jun. 1973 - 9 Dec. 1974
T. T. Chen, O. D. Bohning et al May 1975 240 p refs
(Contract NAS1-12435)
(NASA-CR-132643; C74-1041/501) Avail: NTIS HC $7.50 CSCL 14B

System integration methods for bubble domain flight records are investigated. Bubble memory module packaging and assembly, the control electronics design and construction, field coils, and permanent magnet bias structure design are studied. A small 60-k bit engineering model was built and tested to demonstrate the feasibility of the bubble recorder. Based on the various studies performed, a projection is made on a 50,000,000-bit prototype recorder. It is estimated that the recorder will occupy 190 cubic in., weigh 12 lb, and consume 12 w power when all of its four tracks are operated in parallel at 150 kHz data rate. Author

N75-26337*# Texas Univ., Dallas.
LABORATORY PLASMA PROBE STUDIES Semiannual Status Report, 1 Aug. 1974 - 31 Jan. 1975
Walter J. Heikkila 31 Jan. 1975 37 p
(Grant NGR-44-004-030)
(NASA-CR-143032) Avail: NTIS HC $3.75 CSCL 14B

Diagnostic experiments performed in a collisionless plasma using CO2 as the working gas are described. In particular, simultaneous measurements that have been performed by means of Langmuir- and RF-probes are presented. A resonance occurring above the parallel resonance in the frequency characteristic of a two electrode system is interpreted as being due to the resonant excitation of electroacoustic waves. Author

N75-26338*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INVESTIGATION OF FACSIMILE CAMERA-SPECTROMETER CAPABILITY IN THE 1.0 TO 2.7 MICRON SPECTRAL RANGE
W. Lane Kelly, IV Jun. 1975 20 p refs
(NASA-TM-X-72714) Avail: NTIS HC $3.25 CSCL 14B

The capability of the facsimile camera augmented with a filter-spectrometer to provide scientifically valuable information in the 1.0 to 2.7 microns spectral range was investigated for a future planetary lander mission to Mars. A computer model was used to evaluate tradeoffs between signal-to-noise ratio, spatial and spectral resolution, and the number of spectral channels. Spectral absorption features resulting from water and chemical variations found in pyroxenes were used to represent scientific information of interest to biologists and geologists. Expected output data from a filter-spectrometer is illustrated which indicates that important information pertaining to water content and chemical composition can be obtained using six to eight spectral channels with 0.3 degree spatial resolution. Author

N75-26339*# Institute of Research and Instrumentation, Houston, Tex.
LONG TERM FLIGHT ELECTRODES
Benjamin Mosier [1975] 92 p
(Contract NAS9-2762)
(NASA-CR-141876) Avail: NTIS HC $4.75 CSCL 14B

The reproducibility, stability, and methods of preparation for the various types and forms of biomedical electrodes are discussed. A critical and selective compilation of information on biological and/or physiological electrodes is presented. A discussion of plant hydrocolloids, clays, hydrophyllic colloids, synthetic waxes, and acrylic polymers is included. Author

N75-26340*# Itek Corp., Palo Alto, Calif. Optical Systems Div.
PHOTOGRAPHIC EQUIPMENT TEST SYSTEM (PETS) Final Report
17 Jun. 1975 28 p
(Contract NAS9-14460)
(NASA-CR-141893) Avail: NTIS HC $3.75 CSCL 14E

The Photographic Equipment Test System is presented. The device is a mobile optical system designed for evaluating performance of various sensors in a laboratory, in a vacuum chamber or on a flight line. The carriage is designed to allow elevation as well as azimuth control of the direction of the light from the collimator. The pneumatic tires provide an effective vibration isolation system. A target/illumination system is mounted on a motor driven linear slide, and focusing and exposure control can be operated remotely from the small electronics control console. Author

N75-26341*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.
AUTOMATIC EXPOSURE IRIS CONTROL (AEIC) FOR DATA ACQUISITION CAMERA Final Report
George E. McAtee, Jr., Louis J. Stoap, Curtis D. Solheim, and James T. Sharpsteen Apr. 1975 69 p refs
(Contract NAS9-12790)
(NASA-CR-141884; SPO-30284-00800) Avail: NTIS HC $4.25 CSCL 14E

A lens design capable of operating over a total range of f/1.4 to f/11.0 with through the lens light sensing is presented along with a system which compensates for ASA film speeds as well as shutter openings. The space shuttle camera system package is designed so that it can be assembled on the existing 16 mm DAC with a minimum of alteration to the camera.
J.M.S.

N75-26342*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.
AUTOMATIC EXPOSURE CONTROL FOR SPACE SEQUENTIAL CAMERA Final Report
George E. McAtee, Jr., Louis J. Stoap, Curtis D. Solheim, and James T. Sharpsteen Apr. 1975 184 p
(Contract NAS9-12790)
(NASA-CR-141885; SPO-30284) Avail: NTIS HC $7.00 CSCL 14E

The final report for the automatic exposure control study for space sequential cameras, for the NASA Johnson Space Center is presented. The material is shown in the same sequence that the work was performed. The purpose of the automatic exposure control is to automatically control the lens iris as well as the camera shutter so that the subject is properly exposed on the film. A study of design approaches is presented. Analysis of the light range of the spectrum covered indicates that the practical range would be from approximately 20 to 6,000 foot-lamberts, or about nine f-stops. Observation of film available from space flights shows that optimum scene illumination is apparently not present in vehicle interior photography as well as in vehicle-to-vehicle situations. The evaluation test procedure for a breadboard, and the results, which provided information for the design of a brassboard are given. Author

N75-26343# Advisory Group for Aerospace Research and Development, Paris (France).
A GUIDE TO MICROFICHE EQUIPMENT AVAILABLE IN EUROPE
Apr. 1975 112 p
(AGARD-R-628) Avail: NTIS HC $5.25

A guide, composed of six sections listing equipment in each section alphabetically by manufacturer, with the names and addresses of their distributors in the appendix, alphabetically listed per European country is presented. The kinds of equipment illustrated are: (1) cameras and camera-processors; (2) processors;

(3) duplicators and printer-processors; (4) reader-printers (at the back of the section are included two enlargers), (5) readers; (6) cutters, reader-fillers, strip-up systems, inspection devices, densitometers, and the two most commonly used test targets.
Author

N75-26344# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung fuer Extraterrestrische Sensortechnik.
OPTICAL EXPERIMENTS IN THE ADDITIONAL ROCKET PROGRAM FOR AZUR, PROJECT SPAZ. PART 1: AURORA PHOTOMETER Z.6 Final Report [DIE OPTISCHEN EXPERIMENTE IM ZUSATZRAKETEN-PROGRAMM ZU AZUR, PROJEKT SPAZ. TEIL 1: DAS POLARLICHT-PHOTOMETER Z.6]
Dieter Beran Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1974 94 p refs In GERMAN; ENGLISH summary
(Contract WRK-114-a)
(BMFT-FB-W-74-13) Avail: NTIS HC $4.75; ZLDI, Munich DM 19.80

The Z.6 aurora photometer is described which measures aurora emissions. Its physical and technical characteristics are presented, and individual components, such as the photomultiplier, interference filter, and electronic equipment, are described in detail. Absolute calibration with a tungsten ribbon lamp is discussed along with the final calibration factor. Environmental tests were conducted and are analyzed. Author (ESRO)

N75-26345# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung fuer Extraterrestrische Sensortechnik.
OPTICAL EXPERIMENTS IN THE ADDITIONAL ROCKET PROGRAM FOR AZUR, PROJECT SPAZ. PART 2: THE IONIZATION CHAMBER PHOTOMETER Z.7A AND THE EBERT SPECTROMETER Z.7B Final Report [DIE OPTISCHEN EXPERIMENTE IM ZUSATZRAKETENPROGRAMM ZU AZUR, PROJEKT SPAZ. TEIL 2: DAS IONISATIONS-KAMMER-PHOTOMETER Z.7A UND DAS EBERT-SPEKTROMETER Z.7B]
Dieter Beran Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1974 73 p refs In GERMAN; ENGLISH summary
(Contract WRK-144-b)
(BMFT-FB-W-74-14) Avail: NTIS HC $4.25; ZLDI, Munich DM 15.35

An ionization chamber photometer for measuring the auroral emission of OI (1304a), and an Ebert spectrometer for recording the auroral spectrum between 1800 and 3700A are discussed. Descriptions of both instruments are given, and calibration procedures and environmental test results are included. ESRO

N75-26346# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
AERO-ACOUSTIC MICROPHONE SHROUDS FOR SOUND MEASUREMENT AND LOCALIZATION WITHIN FLOW FIELDS
Gerhard Schulz 1975 44 p refs In GERMAN; ENGLISH summary
(DLR-FB-75-08) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. DM 18.20

In order to prevent flow distortion in wind tunnel microphones, aerodynamic shrouds were designed and investigated. Three microphone shrouds with favorable aerodynamic disk shapes were tested in a wind tunnel and outside of it. The disk shapes allow sound measurements free of disturbances over a wide range of angles; the directional sensitivity of the configurations was augmented by suitable design provisions of the shrouds.
Author (ESRO)

N75-26347# Manlabs, Inc., Cambridge, Mass.
PREPARATION AND FABRICATION OF CRYSTALLINE MATERIALS FOR USE AS SURFACE ACOUSTIC WAVE DEVICES Final Report, 1 Jul. 1973 - 30 Jun. 1974
S. A. Kulin and E. P. Warekois 1 Sep. 1974 23 p refs
(Contract F19628-74-C-0021; AF Proj. 5635)
(AD-A003664; AFCRL-TR-74-0412) Avail: NTIS CSCL 09/1

The work performed under this contract was concerned with the development of techniques for the preparation and fabrication of surface wave plates for ultimate use as devices. Particular emphasis was on the definition of crystallographic orientation, the preparation of damage-free surfaces for low loss devices and the actual fabrication of special geometries for use as surface wave circuit components. Three kinds of crystalline materials were processed under this investigation: Bismuth Germanium Oxide, Lithium Tantalate and Lithium Niobate, each having its own characteristics. GRA

N75-26348# ARO, Inc., Arnold Air Force Station, Tenn.
A TRANSIENT ENTHALPY PROBE FOR THE CALIBRATION OF HIGH HEAT FLUX ABLATION FACILITIES Final Report, 1 Jan. 1972 - 1 Mar. 1973
R. T. Smith, W. N. MacDermott, and T. L. Giltinan AEDC Jan. 1975 62 p refs Sponsored by AF
(AD-A003950; ARO-PWT-TR-74-65; AEDC-TR-74-116) Avail: NTIS CSCL 14/2

The measurement of enthalpy in high energy ablation facilities is extremely difficult because of the high heat transfer rates which preclude the use of conventional steady state enthalpy probes. A transient enthalpy probe which can be swept through the flow and obtain the required enthalpy data in less than probe destruction time has been designed and tested at the Arnold Engineering Development Center (AEDC). This report presents the results of the development and testing of this probe. The probe has been tested in a 5-MW arc heated facility at probe stagnation pressures to 100 atm, measured enthalpy to 4000 Btu/lb, and heat fluxes in excess of 10,000 Btu/sq ft-sec. Results show that the transient enthalpy probe has evolved into a rugged calibration tool for use in such extreme environments.
GRA

N75-26349# General Electric Co., Philadelphia, Pa. Reentry and Environmental Systems Div.
SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON SMALL ANGLE FORWARD LIGHT SCATTERING Final Report
E. Batutis, R. Boericke, and H. Sadjian Aug. 1974 121 p
(Contract DOT-CG-32370-A)
(AD-A003863; USCG-D-32-75) Avail: NTIS CSCL 14/2

A real time Shipboard Oil-In-Water Content Monitor using direct in situ measurements and electro-optical processing has been proven feasible. The concept uses spatial filtering of small angle forward scattering laser light allowing discrimination of oil particles only. The breadboard model used in this study has indicated that accuracies in the 0 to 100 ppm oil range on the order of plus or minus 10% or better can be expected for many oil types ranging from unrefined crudes to refined lubricating oils and hydraulic oil as well as mixtures of these oils. The interference of gas bubbles and solid particulates is eliminated for the most part by optically spatial filtering the diffraction pattern and centrifuging the sample stream. A test program involving studies of oil types, oil mixtures, oil concentrations, salinity, solids, air, mixtures of air and solids, and effects of detergent is described in this report along with graphical and tabular presentations of all data. Major problem areas disclosed by this study are described in detail and involve mostly sampling and sample handling techniques rather than detector-performance characteristics. Conclusions and recommendations are also included, indicating areas for continued study and development. GRA

N75-26350# Army Natick Labs., Mass.
LOW POWER IMPACT VELOCITY AND ACCELERATION RECORDING SYSTEM WITH PIEZOELECTRIC INPUTS
Clive L. Nickerson Dec. 1974 33 p refs
(DA Proj. 1J6-62708-D-552)
(AD-A003826; AMEL-75-29; USA-NLABS-TR-75-29-AMEL) Avail: NTIS CSCL 14/3

The report describes the development of two low power solid state signal conditioning units and associated piezoelectric transducers which when coupled with a previously developed magnetic tape recorder form a system used to measure and record the impact velocity and impact deceleration experienced by containers during shipment. GRA

N75-26351# Naval Ordnance Station, Louisville, Ky.
TEMPERATURE COMPENSATED PIN GAUGE Final Report

Sep. 1974 38 p
(AD-A003942; NOSL-MT-014) Avail: NTIS CSCL 14/2

This temperature compensating measuring device was designed with the concept of accurately measuring large diameters (in the range of 11 to 12 feet) with less than .001 in. tolerance. Design and manufacture was prompted by the machining and inspecting techniques used for the 5 in./54 Gun Mount Radial Roller paths. The resultant effect of grinding the roller path, despite flood cooling, raised the path temperature 12 to 15F above the nominal ambient temperature. Conventional inspecting, by using a mechanical pin gauge, necessitated making allowances for the path's contraction. The Temperature Compensating Pin Gauge, electronic circuits (in conjunction with thermistors to detect the temperature of the gauge and ring), provide dimensional compensation such that the output reading represents the actual diameter of the part at 68F. The electronic device and pin gauge have proven successful in dimensional compensation for temperature variations between 54F and 114F. GRA

N75-26352# Systems Research Labs., Inc., Dayton, Ohio.
AIR FORCE APPROACHES TO NIGHT GATED PHOTOGRAPHY Final Report, Jul. 1972 - Jan. 1974
James C. Rachal, Jr. and Ronald N. Hubbard Oct. 1974 42 p refs
(Contract F33615-73-C-1135)
(AD-A003502; AFAL-TR-74-179) Avail: NTIS CSCL 14/5

Performance of present non-gated active night photographic systems is severely constrained by the effects of atmospheric backscatter. The use of a gated image intensifier camera in conjunction with a pulsed illuminator to eliminate backscattered energy offers significant potential for improvement over non-gated night photographic systems. This paper presents an analytical approach to the problem and experimental data to verify the analytical approach. GRA

N75-26353# Naval Postgraduate School, Monterey, Calif.
AN ENGINEERING STUDY OF A DIGITAL TACHOMETER AND ITS EFFECTS ON FEEDBACK CONTROL SYSTEMS M.S. Thesis
George W. Goeschel Sep. 1974 95 p refs
(AD-A003543) Avail: NTIS CSCL 14/2

High speed integrated circuitry can be used to realize a tachometer with a high sampling rate at slow speeds. This device would, under certain conditions, be useful in damping transients of fairly fast velocity- and position control systems. After a treatment of the errors which are inherent in this device and other conventional tachometers, a comparative study is made of the effects of digital tachometer on relatively simple feedback control systems. Methods to improve the response are studied. GRA

N75-26354# Aerospace Corp., El Segundo, Calif.
MAGNETIC TAPE CHARACTERIZATION BY SCANNING ELECTRON MICROSCOPE Interim Report
Richard M. Gerber 16 Jan. 1975 15 p refs
(Contract F04701-74-C-0075)
(AD-A004834; TR-0075(5450-38)-1; SAMSO-TR-75-11) Avail: NTIS CSCL 14/5

An experimental program was undertaken to assess the suitability of the scanning electron microscope (SEM) for the determination of magnetic tape quality. The immediate objective of the program was to demonstrate the usefulness of the SEM as a tool for investigating four specific characteristics of magnetic tape. These characteristics were: (a) large-scale variations in the tape front surface; (b) small-scale variations in the tape front surface, including the fine structure and discontinuities; (c) the areal distribution of magnetic particles; and (d) the distribution in depth of magnetic particles within the oxide coating. GRA

N75-26355# Develco, Inc., Mountain View, Calif.
DEEP BOREHOLE STRAINMETER TO MEASURE EARTH STRAIN Final Scientific Report, 15 June. 1970 - 30 Sep. 1974
T. C. Moore, L. H. Rorden, R. L. Kovach, and S. W. Smith 30 Sep. 1974 110 p refs
(Contract F44620-70-C-0112)
(AD-A003710; Rept-428-740930; AFOSR-75-0021TR) Avail: NTIS CSCL 14/2

A highly sensitive multicomponent strainmeter was designed for use in deep boreholes. A shallow-hole version of the deep-hole strainmeter was constructed and tested by operating it in a mine tunnel near the seismically active area around Mina, Nevada. The ability of the strainmeter to record tidal strains of approximately 1 x 10 to the minus 8th power in the horizontal direction and approximately 1 x 10 to the minus 9th power in the vertical direction was demonstrated. GRA

N75-26356# Utah State Univ., Logan. Electro-Dynamics Lab.
ROCKETBORNE FAR-INFRARED CIRCULAR-VARIABLE FILTER SPECTROMETER DEVELOPMENT Final Report, 25 May 1970 - 30 Jun. 1974
Clair L. Wyatt and Doran J. Baker 30 Jun. 1974 25 p
(Contract F19628-70-C-0289; ARPA Order 1366; AF Proj. 8692)
(AD-A004153; AFCRL-TR-74-0360) Avail: NTIS CSCL 14/2

The report concerns the development of high-vacuum liquid-helium cooled circular-variable filter spectrometers. These spectrometers have been successfully used in rocketborne applications to make in situ measurements of the overhead spectral radiance, as a function of rocket height, of the atmospheric emission species in the long wavelength region of the infrared. This research led to the advancement of the state-of-the-art in such aerospace infrared measurements and in several related areas such as the detector-preamplifier interface and cold bearing design. A total of five rocket flights were conducted which resulted in measurements of the overhead radiance, as a function of rocket altitude between 45 and 200 km, of the atmospheric emissions in the 7 to 24 micrometer range of the infrared. GRA

N75-26357# Enviro Control, Inc., Rockville, Md.
SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON LIGHT SCATTERING AT NINETY DEGREES Final Report
J. H. Bochinski and A. R. Hansen Nov. 1974 132 p
(Contract DOT-CG-34170-A)
(AD-A003854; USCG-D-49-75) Avail: NTIS CSCL 14/2

An oil-in-water monitor breadboard for shipboard applications was designed, assembled and evaluated with various types of oils mixed with tap water, salt water, acidified water and water containing suspended solids. The oil-in-water monitor consists of (a) sample handling system designed to remove suspended solids from the sample stream and to homogenize the oil to uniform droplet size ranges, and (b) a unique nonfouling scattered light sensor. The monitor response is linear from 0 to 200 ppm oil concentration. GRA

N75-26358# National Swedish Inst. for Building Research, Stockholm.
DEVELOPMENT OF A THERMISTOR ANEMOMETER FOR THE MEASUREMENT OF AIR VELOCITIES IN VENTILATED ROOMS, SUMMARIES
Lars Hardeman 1974 59 p
(PB-239848/5; ISBN-91-540-2317-3; D2:1974) Avail: NTIS HC $4.25 CSCL 13A

A description is given of a thermistor anemometer which is being developed for use in full-scale tests for the determination of air flow conditions in various premises. In order to make possible computer processing of the test readings, a general mathematical expression was derived. The document also gives instructions for calibration and a description of the measuring equipment used. GRA

N75-26170 Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF THE MEASURING PROPERTIES OF LINEAR ACCELEROMETERS
V. S. Golubev *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 42-63 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 83-98 (For availability see N75-26164 17-31)

N75-26172 Joint Publications Research Service, Arlington, Va.
RECURSIVE DIGITAL FILTRATION AND SPECTRUM ANALYSIS
A. Ya. Kuno and M. D. Genkin *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 86-100 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 124-135 (For availability see N75-26164 17-31)

N75-26175 Joint Publications Research Service, Arlington, Va.
THE ERROR OF A TWO-ROTOR PENDULUM GYROCOMPASS DUE TO ASYMMETRIC ROLLING
A. E. Potemkin *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 7-11 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 71-75 (For availability see N75-26173 17-31)

N75-26176 Joint Publications Research Service, Arlington, Va.
ON THE DAMPING OF LINEAR ROTOR OSCILLATIONS IN SUPERCONDUCTING SUSPENSION
B. A. Ryabov, A. I. Chernomorskiy, and K. B. Yakovlev *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 12-15 Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 76-79 (For availability see N75-26173 17-31)

N75-26177 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF DRIFT MOMENTS ACTING UPON DAMPING ROTOR IN ELECTROSTATIC SUSPENSION
Yu. M. Osipov, Ye. M. Pevzner, and A. N. Balyasnikova *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 16-21 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 79-83 (For availability see N75-26173 17-31)

N75-26178 Joint Publications Research Service, Arlington, Va.
ON THE STABILITY OF A CYLINDRICAL HYDRODYNAMIC SUSPENSION IN APPLICATION TO INTEGRATING ACCELEROMETERS
K. P. Andreychenko and O. G. Andreychenko *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 22-26 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 12, Dec. 1974 p 84-87 (For availability see N75-26173 17-31)

N75-26179 Joint Publications Research Service, Arlington, Va.
KALMAN FILTER WITH BIAS
N. N. Korobov and A. A. Dolgiy *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 27-32 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 45-50 (For availability see N75-26173 17-31)

N75-26180 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF ERRORS OF SELF-CONTAINED INERTIAL NAVIGATION SYSTEMS, ATTRIBUTED TO RANDOM PERTURBATIONS OF ANALOG OF INERTIAL COORDINATE SYSTEM
V. A. Karakashev and S. G. Romanenko *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 33-38 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 75-80 (For availability see N75-26173 17-31)

N75-26181 Joint Publications Research Service, Arlington, Va.
SUBOPTIMUM ALGORITHMS OF FILTRATION IN TARGET POSITION CORRECTION SYSTEMS
A. N. Kayander, B. S. Rivkin, and G. V. Tyumeneva *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 39-45 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 80-85 (For availability see N75-26173 17-31)

N75-26182 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE FEASIBILITY OF REDUCING ONE OF THE ERRORS OF SELF-CONTAINED AZIMUTH FINDING SYSTEMS OF GYROSTABILIZED PLATFORM (GSP)
Z. G. Zost *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 46-52 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 85-91 (For availability see N75-26173 17-31)

N75-26183 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL ANALYSIS OF THE INFLUENCE OF INTERNAL PERTURBATIONS ON PRECISION OF FLOAT GYROSCOPIC INSTRUMENTS
V. Yu. Chizhikov, Ye. A. Izmaylov, and B. P. Tsitsin *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 53-59 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 1, Jan. 1975 p 92-97 (For availability see N75-26173 17-31)

N75-26184 Joint Publications Research Service, Arlington, Va.
UNIAXIAL GYROSCOPIC STABILIZER WITH INSTRUMENTAL DRIFT COMPENSATION CIRCUIT
Yu. B. Vlasov and O. M. Filonov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 60-64 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 67-71 (For availability see N75-26173 17-31)

N75-26185 Joint Publications Research Service, Arlington, Va.
HIGH-SENSITIVITY GYROSCOPE DRIFT METER
R. I. Vcherashniy and Yu. A. Borisov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 65-69 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 71-74 (For availability see N75-26173 17-31)

N75-26186 Joint Publications Research Service, Arlington, Va.
AUTOMATIC PHOTOELECTRIC VERTICAL SENSOR
A. M. Zhilkin, S. A. Khodos, and A. B. Shereshev *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 70-74 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 75-78 (For availability see N75-26173 17-31)

N75-26187 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF BEARING OF CLOCK BALANCE WHEEL ON ELASTIC SUSPENSION
Z. M. Akselrod *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 75-81 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 79-84 (For availability see N75-26173 17-31)

N75-26189 Joint Publications Research Service, Arlington, Va.
ON ONE CONDITION OF MINIMIZATION OF DRIFT MOMENTS OF ELECTROSTATIC GYROSCOPE
V. V. Timofeyev *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 89-96 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 3, Mar. 1975 p 66-70 (For availability see N75-26173 17-31)

N75-26190 Joint Publications Research Service, Arlington, Va.
DOUBLE INTEGRATING VIBRATION ACCELEROMETER WITH OPTICAL DEFLECTION GONIOMETER
N. A. Pykhov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 97-100 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 3, Mar. 1975 p 71-73 (For availability see N75-26173 17-31)

N75-26191 Joint Publications Research Service, Arlington, Va.
ON THE MOTION OF A GYROSCOPE DURING ROTATION OF ITS CARDAN SUSPENSION
V. F. Avdeyev, Ye. Ye. Belyanin, and L. M. Ryzhkov *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 101-104 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 3, Mar. 1975 p 74-76 (For availability see N75-26173 17-31)

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-26359 Minnesota Univ., Minneapolis.
SELF-PULSING IN MEDIUM-POWER He-Ne LASERS Ph.D. Thesis

Christopher Ning-Yue Chow 1974 165 p
Avail: Univ. Microfilms Order No. 75-12188

An analytical model was developed to describe self-pulsing in medium-power He-Ne laser. The numerical results show that the oscillating modes can be coupled by population pulsation such that the resonant dispersion can be linearized as required for undistorted pulse propagation while simultaneously satisfying the uniform gain condition across the inhomogeneous bandwidth. The analyses also predict an increase in pulse velocity as well as power output as the laser becomes locked. Experimental measurements indeed show that when the laser is switched from partially unlocked to fully self-locked operation, the pulse velocity increases by about 9 part in 1,000,000 and the average output power increases by about 0.5 percent. Dissert. Abstr.

N75-26360 California Inst. of Tech., Pasadena.
ELECTROMAGNETIC THEORY OF DISTRIBUTED FEEDBACK LASERS IN PERIODIC DIELECTRIC WAVEGUIDES Ph.D. Thesis
Gary Alan Evans 1975 181 p
Avail: Univ. Microfilms Order No. 75-9523

A theory for distributed feedback lasers in transversely bound structures was developed, and the space harmonics approach was used to discuss the general properties of periodic structures. The coupled mode approach was employed to develop expressions for the threshold gain, longitudinal mode structure, and electromagnetic field distribution for distributed feedback lasers. Three basic structures are considered for distributed feedback lasers-thin film waveguides, diffusion waveguides, and fiber waveguides. Equations for the amplification of a waveguide mode that extends transversely over both regions with and without gain are derived. Analytical expressions are derived for coupling between modes in periodically perturbed dielectric waveguides. Sinusoidal perturbations of the electric permittivity and of the waveguide boundary are considered. Theoretical results indicate that an optimum design of distributed feedback lasers can be achieved by an appropriate choice of geometrical parameters.
Dissert. Abstr.

N75-26361*# Hughes Aircraft Co., Malibu, Calif.
OPTO-MECHANICAL SUBSYSTEM OF A 10 MICROMETER WAVELENGTH RECEIVER TERMINAL WAVEGUIDE LASER LOCAL OSCILLATOR. SERVO SYSTEM Final Report
Mar. 1975 164 p refs
(Contract NAS5-21859)
(NASA-CR-143745; SCG-50096R) Avail: NTIS HC $6.25 CSCL 20E

An engineering model opto-mechanical subsystem for a 10.6-micrometer laser heterodyne receiver is developed, and a C02 waveguide local oscillator and servo electronics are provided for the receiver. Design goals are presented for the subsystems and overall package design is described. Thermal and mechanical distortion loading tests were performed and the results are included. Author

N75-26362# California Univ., Berkeley. Electronics Research Lab.
THEORETICAL STUDY AND EXPERIMENTAL DEVELOPMENT OF THIN-FILM LASERS AND MODULATORS FOR USE IN INTEGRATED OPTICS Final Report
Dec. 1974 7 p refs
(Contract AF-AFOSR-2114-71; AF Proj. 9768)
(AD-A004138; AFOSR-75-0081TR) Avail: NTIS CSCL 20/5

Wave-optics analysis of thin-film modulators based on the principle of polarization conversion was completed and experimental demonstration of the principle was performed. Novel structures for Bragg lasers were proposed and analyzed. The feedback mechanisms were elucidated which made possible many possible structures for thin-film Bragg lasers. Experimental work on gratings and chemical etching showed excellent results. GRA

N75-26363# Aerospace Corp., El Segundo, Calif.
A MULTIPLE-SELECTED-LINE UNSTABLE RESONATOR Interim Report
Richard A. Chodzko 31 Dec. 1974 24 p refs
(Contract F04701-74-C-0075)
(AD-A004072; TR-0075(5240-10)-1; SAMSO-TR-74-277)
Avail: NTIS CSCL 20/5

A new type of unstable resonator has been developed that permits multiple-selected-line operation. Selected-line operation is obtained with a diffraction grating oriented at an angle different from the Littrow angle. Secondary feedback mirrors at the appropriate angles provide an independent three-element cavity for each wavelength selected. Two types of multiple-selected-line unstable resonators are considered: (1) an edge-coupled design, which produces an annular beam with a 45-deg output coupling mirror, and (2) a continuously coupled design, which uses the primary zero-order beam as output. Experiments have been carried out with a multiple-selected-line unstable resonator on a CW HF laser. Selected-line operation was obtained on the P2 and P1 HF transitions in a continuously coupled design. GRA

N75-26364# Raytheon Co., Waltham, Mass. Research Div.
LASER WINDOW STUDIES Semiannual Technical Report, 20 May - 20 Nov. 1974
D. Bua, H. Statz, and F. Horrigan Dec. 1974 76 p refs
(Contract DAAH01-74-C-0719; ARPA Order 1180)
(AD-A004029; S-17990) Avail: NTIS CSCL 20/5

This report deals largely with the characterization of films (ZnSe, ZnS, As2S3 and ThF4) on high power laser window substrates (BaF2 and ZnSe). Thus far attenuated total internal reflection spectra have been taken of As2S3 on BaFBF2' and calorimetric measurements for film absorption studies have been developed and applied to As2S3 on BaF2. A literature search has been undertaken to determine liquid coolants for high power windows but no promising candidates were found. A literature search of the mechanical, physical and chemical properties of films was made. Adhesion measurements have begun using pull tests and peeling tests, as well as microhardness measurements using a small diamond indenter in conjunction with the scanning electron beam microscope. GRA

N75-26365# Avco-Everett Research Lab., Everett, Mass.
CARBON MONOXIDE LASER Annual Technical Report
R. E. Center and M. J. W. Boness Jan. 1975 65 p refs
(Contract N00014-72-C-0030; ARPA Order 1807)
(AD-A003584) Avail: NTIS CSCL 20/5

The main objective of this program is the investigation of the pulsed electrical CO laser to determine the relative scaling parameters and the usefulness of high power CO lasers in systems applications. The current contract has included measurements of small signal gain on varying vibrational and rotational transitions, operation with an unstable resonator and the design fabrication and assembly of an entirely new transverse flow system together with a new heat exchanger. Gain measurements were compared with parametric performance predictions derived from kinetic modelling calculations. The new flow system discharge cavity and heat exchanger have been designed with the aim of obtaining a near diffraction limited beam from the pulsed CO laser. The design considerations are described. GRA

N75-26366# Hughes Research Labs., Malibu, Calif.
LASER WINDOW SURFACE FINISHING AND COATING TECHNOLOGY Semiannual Technical Report
Morris Braunstein Aug. 1974 55 p refs
(Contract F19628-73-C-0243; ARPA Order 2415; AF Proj. 2415)
(AD-A003666; AFCRL-TR-74-0425; SATR-2) Avail: NTIS CSCL 20/5

Potassium chloride surfaces have been produced on reactive atmosphere processed (RAP) KCl using HCl etching which show an order of magnitude improvement in KCl surface damage resistance. Surface damage level approaches the bulk level in some KCl samples. An inverse dependence of 10.6 micrometer optical absorption on film deposition rate is reported for germanium films, beta of approximately 10/cm is reported for the best films. Ion beam sputtering of ThF4 using pure argon ion beams results in films deficient in fluorine having high optical absorption at 10.6 micrometers. Reactive sputtering in argon-fluorine gas mixtures may be required for producing stoichiometric fluoride films. Rutherford backscattering for chemical analysis of films and window surface structure promises to be a new powerful

technique for such studies, using moderate beam energies of 180 KeV H(+) and 280 KeV H(++). GRA

N75-26367# ARO, Inc., Arnold Air Force Station, Tenn.
DEGRADATION OF LOW SCATTER MIRRORS BY PARTICLE CONTAMINATION Final Report, 1 Feb. - 30 Jun. 1975
R. P. Young AEDC Jan. 1975 37 p refs Sponsored by AF
(AD-A004103; ARO-VKF-TR-74-84; AEDC-TR-74-109) Avail: NTIS CSCL 20/6

Mirrors with very low scattering optical surfaces are being used in space borne IR sensors. Dust particles depositing on the surface of these low scatter mirrors can cause an increase in the amount of radiation scattered. A study was made to determine the effect of particle contaminant on the mirror scattering properties. Results of the scattering measurements were compared with predicted values, based on an assumed Lambertian distribution of the scattered radiation. Particles of sizes smaller than the incident radiation wavelength produced less scattered radiation than predicted; whereas, particles of the size or larger than the incident radiation wavelength produced more scattered radiation than predicted. GRA

N75-26368*# Scientific Translation Service, Santa Barbara, Calif.
LASER INDUCED THERMAL DESORPTION ON SOLID SURFACES Ph.D. Thesis
Manfred Neumann Washington NASA Jun. 1975 105 p refs Transl. into ENGLISH of the thesis "Laserinduzierte Thermische Desorption von Festkoerper - Oberflaechen" Hannover, Technische Universitat, 1973 122 p
(Contract NASw-2483)
(NASA-TT-F-16434) Avail: NTIS HC $5.25 CSCL 20E

A study was conducted which showed that laser-induced thermal desorption is a suitable approach for the examination of the kinetics of adsorption-desorption processes. It is shown that the measurements involved can be performed with the aid of a thermal relaxation procedure. The approach can also be used in the case of supported catalysts. Studies of the effect of laser-induced desorption are considered, giving attention to the mass spectroscopic determination of the pressure increase at desorption, the excitation mechanisms of desorption, and the dependence of the pressure increase on laser power density. The desorption process is used to study the oxidation of CO and a Pd surface. Author

N75-26369# School of Aerospace Medicine, Brooks AFB, Tex.
PICOSECOND PULSES DUE TO SELF MODE LOCKING IN LASERS Interim Report, Jan. - Feb. 1974
John Taboada Feb. 1974 25 p refs
(AD-A003626; SAM-TR-74-47) Avail: NTIS CSCL 20/5

Picosecond pulses due to self-mode-locking have been observed in the Chromatix 1000 Nd-YAG and Spectra Physics 125 HeNe lasers. In the Chromatix 1000 laser, self-mode-locking appears to be a random event; whereas in the Spectra Physics 125 laser, self-mode-locking appears to be continuous. The results of an experimental study of these two lasers are presented in the context of their operation and a simplified theory of mode locking in lasers. The implications of this study to ocular-tissue laser-damage threshold measurements and safety are discussed. GRA

N75-26779 Hughes Aircraft Co., Culver City, Calif.
LASER AND LOW LIGHT LEVEL TELEVISION SYSTEMS
Richard D. Hudson, Jr. and Jacqueline W. Hudson (Arjay Associates, Encino, Calif.) *In* AGARD Electro-Opt. Systems May 1975 14 p refs (For availability see N75-26778 17-70)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-26370 British Library Lending Div., Boston Spa (England).
THE INVESTIGATION BY MODEL OF THE RESISTANCE OF SPINDLE AND SHAFT JOURNALS TO THE EFFECTS OF FRICTIONAL FATIGUE
E. Romanowski 4 Oct. 1974 27 p refs Transl. into ENGLISH from Probl. of Friction, Wear and Lubrication v. 10, 1971 p 159-177
(BLL-CE-Trans-6447-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A model was used to investigate the frictional fatigue resistance of machine components subjected to the combined action of rotatory-bending loads and frictional sliding movement in the dry state. Test pieces of 45-steel in the normalized condition were used and test results are presented. L.B.

N75-26371* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCESS FOR MAKING SHEETS WITH PARALLEL PORES OF UNIFORM SIZE Patent
Joseph M. Sherfey, inventor (to NASA) Issued 3 Jun. 1975 8 p Filed 24 Mar. 1971 Supersedes N71-34427 (09-21, p 3433)
(NASA-Case-GSC-10984-1; US-Patent-3,887,365;
US-Patent-Appl-SN-127480; US-Patent-Class-75-214;
US-Patent-Class-29-182.2; US-Patent-Class-29-182.5;
US-Patent-Class-29-420.5; US-Patent-Class-65-3;
US-Patent-Class-75-200; US-Patent-Class-75-208R;
US-Patent-Class-75-212; US-Patent-Class-75-222;
US-Patent-Class-75-DIG.1; US-Patent-Class-161-92;
US-Patent-Class-161-93; US-Patent-CLASS-117-126R;
US-Patent-Class-117-126GM) Avail: US Patent Office CSCL 13H

Processes for making sheets with parallel pores of uniform size are described. In one form, the process comprises the steps of: extruding a slurry formed of short, nonmetallic filament pieces, a metal powder, water, and a plasticizer through a suitable orifice to align the filament pieces parallel to one another; cutting the extrusion into suitable sections; stacking the sections in parallel in a refractory container; compacting the stack; heating the stack in a reducing atmosphere; compacting while hot, if necessary; slicing, at right angles to the longitudinal axis of the original sections, the thusly formed billet into sheets; and leaching out the filament pieces in each sheet. In a alternate form, a continuous filament was used. The continuous filament is drawn through a slurry containing metal powder which may include a solder, water and a plasticizer rather than being extruded through an orifice. In a still further form, the continuous coated filament is wound onto a suitably shaped spool.
Official Gazette of the U.S. Patent Office

N75-26372* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF DETERMINING BOND QUALITY OF POWER TRANSISTORS ATTACHED TO SUBSTRATES Patent
Thomas A. Telfer, inventor (to NASA) (GE, Utica, N. Y.) Issued 10 Jun. 1975 4 p Filed 26 Apr. 1974 Supersedes N74-21858 (12- 13, p 1527) Sponsored by NASA
(NASA-Case-MFS-21931-1; US-Patent-3,889,122;
US-Patent-Appl-SN-464721; US-Patent-Class-250-359;
US-Patent-Class-250-460; US-Patent-Class-250-492) Avail: US Patent Office CSCL 13H

A method of determining the quality of the bond between a power transistor and an electrically insulative, heat conductive substrate is described; the method takes X ray exposure of the bond. In the exposures, the areas where the bond quality is poor show up as dark in relation to a lighter background area where the bond quality is good. The exposures are tested in a light meter device in which the average transparency of on exposure indicates the percentage of voids, or poorly bonded areas. Only those units having less than a predetermined percentage of voids are acceptable.
Official Gazette of the U.S. Patent Office

N75-26373 Illinois Univ., Urbana.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF FRICTIONAL PHENOMENA IN HIGH CAPACITY GEAR DRIVES Ph.D. Thesis
Henry William Stoll, Jr. 1974 270 p
Avail: Univ. Microfilms Order No. 75-11769

Methods were developed for increasing scoring resistance and efficiency of high capacity gear drives through improved understanding and control of friction phenomena in gearing. Friction functions, based upon elastohydrodynamic lubrication

theory and experimental studies' are used to predict the instantaneous coefficient of friction existing in heavily loaded gear tooth contacts. A theoretical study is conducted to determine the effect of a wide range of operating conditions and gear system parameters on frictional phenomena in gearing. Results of the study reveal the effects produced by variation in the many interrelated factors influencing frictional phenomena in gearing. Based on the theoretical investigation, it is concluded that both power loss and critical temperature associated with the operation of high capacity gear drives can be significantly reduced through proper selection and control of the factors influencing the frictional phenomena in gearing. It is also shown that methods can be used to design gear drives with substantially improved scoring resistance as well as increased efficiency. Dissert. Abstr.

N75-26374*# California State Univ., Northridge.
STRESSES IN A WEBBED BALL Final Report
L. J. Nypan Washington NASA Jun. 1975 52 p refs
(Grant NGL-05-062-002)
(NASA-CR-2562) Avail: NTIS HC $4.25 CSCL 13I

An experimental stress analysis was undertaken to evaluate stresses within cylindrically hollow reinforced webbed bearing balls proportioned for a 50 percent mass reduction. Strain gage rosettes were used to determine principal strains and stresses in the steel ball models, which were statically loaded in various orientations. Results are reported for 127 mm (5 in.) outside diameter balls under 44,500 N (10,000 lb) loads. Similitude considerations permit these results to be applied to calculations of stresses in actual size drilled bearing balls proportioned to these mass reductions. Author

N75-26375*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC CAPACITY AND SURFACE FATIGUE LIFE FOR SPUR AND HELICAL GEARS
John J. Coy, Dennis P. Townsend (Army Air Mobility R and D Lab.), and Erwin V. Zaretsky 1975 38 p refs Presented at the Joint Lubrication Conf., Miami, Fla., 21-23 Oct. 1975; Sponsored jointly by the Am. Soc. of Lubrication Eng. and ASME
(NASA-TM-X-71743; E-8273) Avail: NTIS HC $3.75 CSCL 13I

A mathematical model for surface fatigue life of gear, pinion, or entire meshing gear train is given. The theory is based on a previous statistical approach for rolling-element bearings. Equations are presented which give the dynamic capacity of the gear set. The dynamic capacity is the transmitted tangential load which gives a 90 percent probability of survival of the gear set for one million pinion revolutions. The analytical results are compared with test data for a set of AISI 9310 spur gears operating at a maximum Hertz stress of 1.71 billion N/sq m and 10,000 rpm. The theoretical life predictions are shown to be good when material constants obtained from rolling-element bearing tests were used in the gear life model. Author

N75-26376# Division of Mechanical Engineering, Ottawa (Ontario).
THE CALIBRATION OF A DEUTZ F8L413 DIESEL AND DEVELOPMENT OF AN ON-BOARD BHP INDICATOR
W. S. Heggie Feb. 1975 25 p ref
(MET-515; NRC-14649) Avail: NTIS HC $3.25

The calibration of a Deutz F8L413 diesel engine, emphasizing characteristics pertinent to the levitation of an air cushion vehicle is described, together with the development of an output indicating device to be used aboard the craft. The opportunity was also taken to install NRC developed transducers for recording cylinder and fuel injection pressure-time phenomena, with the object of subjecting them to field endurance tests. Output and fuel consumption compared reasonably with manufacturer's data and a horsepower readout system was developed, based on fuel rack position and rotational speed. Author

N75-26377*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A LIFE STUDY OF AUSFORGED, STANDARD FORGED AND STANDARD MACHINED AISI M-50 SPUR GEARS
D. P. Townsend, E. N. Bamberger (GE Co., Evendale, Ohio), and E. V. Zaretsky 1975 33 p refs
(NASA-TM-X-71748; E-8258) Avail: NTIS HC $3.75 CSCL 13I

Tests were conducted at 350 K (170 F) with three groups of 8.9 cm (3.5 in.) pitch diameter spur gears made of vacuum induction melted (VIM) consumable-electrode vacuum-arc melted (VAR), AISI M-50 steel and one group of vacuum-arc remelted (VAR) AISI 9310 steel. The pitting fatigue life of the standard forged and ausforged gears was approximately five times that of the VAR AISI 9310 gears and ten times that of the bending fatigue life of the standard machined VIM-VAR AISI M-50 gears run under identical conditions. There was a slight decrease in the 10-percent life of the ausforged gears from that for the standard forged gears, but the difference is not statistically significant. The standard machined gears failed primarily by gear tooth fracture while the forged and ausforged VIM-VAR AISI M-50 and the VAR AISI 9310 gears failed primarily by surface pitting fatigue. The ausforged gears had a slightly greater tendency to fail by tooth fracture than the standard forged gears. Author

N75-26378*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THRUST BEARING Patent Application
William J. Anderson, inventor (to NASA) Filed 25 Jun. 1975 13 p
(NASA-Case-LEW-11949-1; US-Patent-Appl-SN-590182) Avail: NTIS HC $3.25 CSCL 13I

A gas-lubricated thrust bearing is described which employs relatively rigid inwardly cantilevered spokes carrying a relatively resilient annular member or annulus. This annulus acts as a beam on which are mounted bearing pads. The resilience of the beam mount causes the pads to accept the load and, with proper design, responds to a rotating thrust-transmitting collar by creating a gas film between the pads and the thrust collar. The bearing may be arranged for load equalization thereby avoiding the necessity of gimbal mounts or the like for the bearing. It may also be arranged to respond to rotation in one or both directions. NASA

N75-26379# Little (Arthur D.), Inc., Cambridge, Mass.
SURVEY STUDY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS, VOLUME 1 Final Report
W. Lyman, L. Nelson, L. Partridge, A. Kalelkar, and J. Everett Mar. 1974 196 p refs
(Contract DOT-CG-24655-A)
(AD-A004311; USCG-D-46-75-Vol-1) Avail: NTIS CSCL 13/2

This study is directed toward the foundation of a planned research and development program which, when initiated on a priority basis, would result in a significantly improved capability to ameliorate spills of hazardous chemicals. Once available, the amelioration equipment would provide the U.S. Coast Guard On-Scene Coordinator with an inventory of response equipment and systems that would permit effective countermeasure action against accidental discharges of hazardous chemicals into waterbodies. The work entailed the categorization of hazardous chemicals according to physical and chemical characteristics that were perceived to be amenable and important to the development of amelioration techniques. A total of 400 hazardous chemicals deemed to encompass most of the more critical chemicals in terms of quantity shipped and the severity of the hazards presented were associated with each of approximately 30 amelioration categories. A representative chemical was then selected for each category with the intent that it would provide the basis for searching for, evaluating, and developing amelioration methods from each category. The representative chemicals were chosen by assessing the chemical and physical behavior of the chemicals, their risk indices, and other practical considerations. GRA

N75-26380# Little (Arthur D.), Inc., Cambridge, Mass.
APPENDICES TO SURVEY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS, VOLUME 2 Final Report
W. Lyman, L. Nelson, L. Partridge, A. Kalelkar, and J. Everett Mar. 1974 438 p refs
(Contract DOT-CG-24655-A)

(AD-A004312; USCG-D-46-75-Vol-2) Avail: NTIS CSCL 13/2

Contents: Generic classes of chemicals; Physico-chemical categories of the CHRIS chemicals; Master code sheet of classifications; Risk indices for 400 chemicals. GRA

N75-26381# Trans-Sonics, Inc., Burlington, Mass.

THE INVESTIGATION AND INTERPRETATION OF THE NATURE OF WEAR PARTICLES Final Report, 10 May 1973 - 9 Mar. 1974

Vernon C. Westcott and John L. Middleton 9 Mar. 1974 94 p refs

(Contract N00014-73-C-0455)

(AD-A003553) Avail: NTIS CSCL 13/9

The particles of wear were recovered and analyzed from more than 200 oil samples using Ferrographic techniques. Oil samples from controlled component tests and from field operating systems were analyzed. The particles have been classified by morphology and material and have been related to the wear mechanisms. The character of the particles which occur during normal operation is discussed. When the machine starts to fail not only does the amount of particulate matter increase, but some unique types of particles are generated. These types are shown to be related to specific modes of wear and can be used to determine the location of the failure. GRA

N75-26382# Columbia Univ., New York. Lubrication Research Lab.

GAS-LUBRICATED POUROUS BEARING: INFINITELY LONG JOURNAL BEARINGS, STEADY-STATE SOLUTION

Erh-Rong Wu and Vittorio Castelli Nov. 1974 42 p refs

(Contract N00014-67-A-0108-0021; NR Proj. 062-360)

(AD-A003609; Rept-24) Avail: NTIS CSCL 13/9

The general governing equations for finite porous journal bearings with compressible lubricants and slip-flow are derived. A mass content rule is developed for infinitely-long porous bearings; an exact solution is established for a gas-lubricated porous bearing with very large bearing number consistent with the mass content rule. An analytic-numerical technique which takes advantage of the linearity of the pressure equation in the porous medium is developed to solve the problem for finite values of compressibility. The results approach those for the solid bearing case as the defined poro-slip parameter beta becomes very large. GRA

N75-26383# AiResearch Mfg. Co., Phoenix, Ariz.

HIGH TEMPERATURE, HIGH SPEED SOLID LUBRICATED BEARING TECHNOLOGY. PHASE 1: HEAT TRANSFER Technical Report, 1 Mar. 1973 - 1 Jul. 1974

Paul R. Bissett, Richard L. Downey, and Robert A. Solomon Aug. 1974 370 p refs

(Contract F33615-73-C-2020; AF Proj. 3048)

(AD-A003635; AiResearch-74-410569-1; AFAPL-TR-74-77-Vol-1) Avail: NTIS CSCL 13/9

The report describes a thorough analysis of the heat transfer characteristics of solid lubricated bearings. Two major aspects are investigated. These are heat generation within the bearing, and bearing cooling techniques. Bearing heat generation was studied, both analytically and experimentally. Computerized heat generation predictions were made and compared to actual performance data. Bearing component experiments were conducted in order to determine material and geometric effects and the significance of the various heat transfer modes. In addition, the importance of bearing operating conditions upon heat generation was also determined. A number of bearing cooling techniques was investigated. The influence of bearing geometric changes and cooling medium supply methods were determined. Much of the data is presented in nondimensional form. GRA

N75-26384# Army Construction Engineering Research Lab., Champaign, Ill.

EFFECTS OF CLUSTER POROSITY ON THE TENSILE PROPERTIES OF BUTT-WELDMENTS IN T-1 STEEL

E. M. Honig, Jr. Nov. 1974 32 p refs

(AD-A004001; CERL-TR-M-109) Avail: NTIS CSCL 13/5

The effects of cluster porosity on the tensile properties of T-1 steel butt-weldments were assessed in a program consisting of three phases of experimentation. In the first phase, cluster porosity was expressed as a percentage of the total cross section. In the second phase, cluster porosity was measured both in terms of the actual total area of pores and the area of the cluster (including metal ligaments, or webs, that connect pores). These two phases showed that the tensile strength of the welded metal is not significantly reduced if the area of pores and the cluster area are below critical sizes; however, ductility is rapidly reduced until these sizes are reached. The third phase established a partial correlation between cluster porosity size and the length of a center-crack in a plate. The J integral concept of fracture mechanics was used to examine the existence of a critical value of the J integral with which the critical pore area size (or other measure of cluster porosity) could be correlated. GRA

N75-26385# Army Construction Engineering Research Lab., Champaign, Ill.

APPLICATION OF ACOUSTIC EMISSION TO WELD MONITORING Interim Report

A. Kumar Dec. 1974 17 p refs

(DA Proj. 4A1-62121-A-891)

(AD-A003992; CERL-IR-M-117) Avail: NTIS CSCL 13/8

The report discusses the feasibility of applying acoustic emission to real-time monitoring of gas metal arc welding. A state-of-the-art survey indicated that investigators had some success with detecting cracks, porosity, and slag inclusion during the welding of steels by monitoring acoustic emission. The presence of cracks was most easily detected in gas tungsten arc welding of stainless steels. Slag inclusions associated with roped bead in submerged arc welding can also be detected by acoustic emission. In the present work, cracks were introduced in a restrained weldment by hydrogen additions to the shielding gas. Selective filtering was used to increase the signal-to-noise ratio. Results show that the acoustic emission rate from cracks is much higher than that from the welding arc noise. A real-time weld monitor for detection of cracks in steel is therefore technically feasible. However, when porosity was introduced, the acoustic emission rate was about the same order as that from the welding arc noise. Thus, porosity could not be detected by the acoustic emission in a real-time weld monitoring situation. GRA

N75-26386# Timken Co., Canton, Ohio.

DUAL DIAMETER ROLLER BEARING TESTS Interim Report, 1 Jul. 1972 - 1 Jul. 1974

Robert F. Cornish and Gary J. Dressler Dec. 1974 42 p

(Contract F33615-72-C-1890; AF Proj. 3048)

(AD-A003510; AFAPL-TR-74-102) Avail: NTIS CSCL 13/9

The report covers the testing of four (4) 140 mm bore, dual diameter roller bearings provided as Government furnished property. The objective was to determine their operating characteristics by test. The bearings were to be operated up to 4,000,000 DN (140 mm bore x 28,600 RPM) with radial loads up to 1,000 pounds and bearing temperature of 600F. The bearings were tested at speeds up to 3,000,000 DN; however, bearing damage occurred in the form of rollers breaking at the change in diameters due to bending fatigue. Lubrication was with polyphenyl ether and MIL-L-7808 oil in an air environment. GRA

N75-26387# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE PROBLEM OF ANALYTICAL LINKS IN CALCULATION PARAMETERS OF ROTORS OF CENTRIFUGAL PUMPS

A. Sh. Drubetskii and V. N. Cherkasov 27 Nov. 1974 18 p refs Transl. into ENGLISH from the book "Vychislitelnaya tekhnika v mashinostroenii" Minsk, Inst. Tekh. Kibernetiki, Dec. 1970 p 92-98

(AD-A004523; FTD-HC-23-2878-74) Avail: NTIS CSCL 13/11

The analytical dependence relating to the basic geometric and hydraulic characteristics of centrifugal pumps is considered. A mathematical formulation of the problem is given. GRA

N75-26388# General Motors Corp., Indianapolis, Ind.

CENTRIFUGAL COMPRESSOR DESIGN CRITERIA: A COMPARISON OF THEORY AND EXPERIMENT Final Report, Jun. - Sep. 1974

Samy Baghdadi, Brink A. Hopkins, and William F. Osborn Dec.

1974 128 p refs
(Contract DAAJ02-73-C-0089; DA Proj. 1G2-62207-AH-89) (AD-A004011; DDA-EDR-8216; USAAMRDL-TR-74-69) Avail: NTIS CSCL 13/7

The objective of this program was to define the utility of the Detroit Diesel Allison Centrifugal Compressor Performance (CCP) analysis. This objective was accomplished by comparing the preexisting analysis of the performance of a new high-pressure-ratio centrifugal compressor (RC-2) with the test data obtained in the course of this program. After the first or baseline compressor tests, the test results were analyzed on the basis of the CCP program, and initial compressor modifications were recommended and carried out. An additional modification was also completed. Prior to each test of the modified compressor, an estimate of the unit's performance was obtained by using the CCP program, and the test results were subsequently compared with this estimate. GRA

N75-26389# Florida Univ., Gainesville. Dept. of Mechanical Engineering.
PRELIMINARY INVESTIGATION OF THE DYNAMIC FORCE RESPONSE COEFFICIENTS FOR SQUEEZE FILM BEARING DAMPERS Final Report, 1 Nov. 1973 - 31 Jul. 1974
John M. Vance and Alan J. Kirton Nov. 1974 96 p refs
(Contract DAHC04-74-G-0048)
(AD-A004020; ARO-12094-1-RTC) Avail: NTIS CSCL 11/8

An experimental study of the hydrodynamic force response of a squeeze film bearing damper with end seals was carried out. Measurements of the pressure distribution about a journal constrained to more in a circular orbit were made for the journal orbit centered in the annular clearance and offset from the center of the annular clearance. The effects of cyclic flow in a radial inlet were studied for the case of the journal orbit centered in the annular clearance. GRA

N75-26390# Trans-Sonics, Inc., Burlington, Mass.
STUDIES OF THE NATURE OF WEAR Progress Report, 1 Dec. 1973 - 30 Jun. 1974
Vernon C. Westcott, Douglas Scott, John L. Middleton, and Robert A. White 28 Oct. 1974 66 p refs
(Contract N00014-74-C-0135; ARPA Order 2532; NR Proj. 229-012)
(AD-A003548) Avail: NTIS CSCL 13/9

It was shown that spherical particles which are found in fatigue cracks of rolling contact elements, i.e. bearings and gears, are not formed in fatigue cracks generated by translational cyclic stress. A Contact Wear Machine was developed to simulate conditions near the pitch line of gears. Test specimens are a simple cylinder and a rectangular anvil. Contact loads and the ratio of sliding motion to rolling motion may be varied. Experiments have been run using Armco 17-4 PH and EN-8 (SAE1040). Ferrograms made from oil samples taken during the experiment with Armco 17-4 contained a large number of spheres prior to the appearance of typical gear fatigue particles. The tests using EN-8 also produced typical gear fatigue particles but no spheres. The fatigue pits found on the test specimens have the same apparent morphology as those found on gears. GRA

N75-26391# Texas Transportation Inst., College Station.
INFLUENCE OF WATER DEPTHS ON FRICTION PROPERTIES OF VARIOUS PAVEMENT TYPES Research Report, Sep. 1968 - Aug. 1974
Bob M. Gallaway, Jerry G. Rose, William W. Scott, Jr., and Robert E. Schiller Aug. 1974 145 p refs Sponsored by Tex. Highway Dept. and DOT
(PB-240262/6; TTI-2-8-69-138-6) Avail: NTIS HC$5.75 CSCL 13B

The results are presented of a study concerned with the effect of various water depths (obtained with a rain simulator) on the friction properties of various pavement textures at different levels of vehicular speeds and tire-tread depths, tire pressures, and tire types. Equations relating these variables are also developed and the relative effects of the variable determined. Tabular and figurative methods are used to present the results. Background information and pertinent past research pertaining to effects of water depth on pavement friction are given. GRA

N75-26165 Joint Publications Research Service, Arlington, Va.
DYNAMICS OF GEAR WHEELS WITH A SPRING MOUNTED RIM
M. D. Genkin, V. K. Grinkevich, and V. I. Poryadkov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 1-5 Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 33-36 (For availability see N75-26164 17-31)

N75-26166 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL RESEARCH ON THE EFFECTIVENESS OF FLEXIBLE RIM FASTENING
M. D. Genkin, V. K. Grinkevich, and V. I. Poryadkov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 6-11 ref Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 37-41 (For availability see N75-26164 17-31)

N75-26167 Joint Publications Research Service, Arlington, Va.
VIBRATIONS OF A TOOTHED RIM ON A FLEXIBLE BASE
M. D. Genkin, V. K. Grinkevich, and V. I. Poryadkov *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 12-20 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 42-48 (For availability see N75-26164 17-31)

N75-26168 Joint Publications Research Service, Arlington, Va.
A VIBRATION DAMPING SUPPORT WITH AN ELECTRO-MECHANICAL CONTROL SYSTEM
V. G. Yelezov *In its* Vibroacoustic processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 21-32 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 66-75 (For availability see N75-26164 17-31)

N75-26169 Joint Publications Research Service, Arlington, Va.
SELECTION OF OPTIMUM PARAMETERS OF AN ACTIVE VIBRATION DAMPER WITH ELECTROMECHANICAL FEEDBACK WITH RESPECT TO RELATIVE DISPLACEMENT AND TOTAL FORCE
M. D. Genkin, V. G. Yelezov, R. B. Statnikov, and V. V. Yablonskiy *In its* Vibroacoustic Processes in Machine and Coupled Devices (JPRS-64910) 4 Jun. 1975 p 1-5 refs Transl. into ENGLISH from the book "Vibroakusticheskiye Protsessy v Mashinakh i Prisoyedinennykh Konstruktsiyakh" Moscow, Izdatelstvo Nauka, 1974 p 76-82 (For availability see N75-26164 17-31)

N75-26188 Joint Publications Research Service, Arlington, Va.
SPRING-DRIVEN CONSTANT-TORQUE MOTOR
V. K. Yankeliovich *In its* Gyroscopic Systems and Instruments of Precision Mechanics (JPRS-64926) 5 Jun. 1975 p 82-88 refs Transl. into ENGLISH from Priborostroyeniye (USSR), no. 2, Feb. 1975 p 84-89 (For availability see N75-26173 17-31)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-26392 New York Univ., N.Y.
ESTIMATION PROBLEM IN MULTI-RISK, MULTI-COMPONENT RELIABILITY MODEL Ph.D. Thesis
Masatoshi Katsuhara 1974 194 p
Avail: Univ. Microfilms Order No. 75-12464

Reliability models are discussed whose estimation problems are interrelated because of singularity of failure time distribution functions. Particular interest is paid to the maximum likelihood estimate under the assumption of the exponential distribution for the cause of the system failure. In the first model, more than one source of the shock and the single component system

are postulated and the exact maximum likelihood estimates of the involved parameters are obtained from the failure times and the number of system failures due to a particular catastrophe. In the second model, an N component model is assumed and two different types of the maximum likelihood estimates for the same parameter are derived. The third model is generalized multirisk, multicomponent model with exponential distributions. The exact maximum likelihood estimates for the parameter in the last model are obtained from failure time statistics only.
Dissert. Abstr.

N75-26393# General Electric Co., Syracuse, N.Y. Electronics Lab.
RELIABILITY PREDICTION FOR MICROWAVE TRANSISTORS Interim Report, 1 Feb. 1973 - 30 Apr. 1974
Donald J. LaCombe Dec. 1974 86 p
(Contract F30602-73-C-0176; AF Proj. 5519)
(AD-A003643; RADC-TR-74-313) Avail: NTIS CSCL 09/1

This report presents the results of the first fifteen months of effort on a program to evaluate the failure mechanisms that occur in state-of-the-art microwave power transistors, and to predict the reliability and lifetime that might be expected from these devices. A series of accelerated rf life tests are being performed followed by detailed failure analyses. Both gold and aluminum metallized devices are being evaluated. The initial work was done on the MSC 1315 and PHI 1510 devices. GRA

N75-26394# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
PROCEEDINGS OF THE INTERDISCIPLINARY WORKSHOP FOR QUANTITATIVE FLAW DEFINITION Interim Technical Report
Donald O. Thompson Nov. 1974 550 p refs Workshop held at Thousand Oaks, Calif., 17-20 Jun. 1974
(Contract F33615-74-C-5180; AF Proj. 7351)
(AD-A003672; SC595.21TR; AFML-TR-74-238) Avail: NTIS CSCL 14/2

Contents: Economic motivation and potential impact of nde; Fracture control for high performance ships and related NDE requirements; State-of-the-art NDE in quantitative inspection; Factors affecting ultrasonic waves interacting with fatigue crack fasteners; Interface waves on interference-fit fasteners; Acoustic wave scattering from a sphere; Impulse analysis of ultrasonic indicia; Adpative non-linear modeling for ultrasonic signal; Studies of electromagnetic sound generation for NDE; Laser generated ultrasonic beams; Advanced magnetic methods of flaw detection; Advanced composites status review; Microscopic description of bond strength, mechanics and processes; Ultrasonic procedures for predicting adhesive bond strength; Applicability of ultrasonic resonance spectroscopy to measuring the strength of bonded materials; NDE prediction of adhesive bond failure areas; Kinetics of moisture degradation in advanced composites; Residual stress effects on the properties and characteristics of engineering; Physical origins of residual stress and present physical techniques for measurement; Acoustic emission - a summary of current understandings; Acoustic emission study of twinning in indium crystals and Pb-Sn alloys; Exo-electron emission from metals; Energy distribution of photo-stimulated electron emission and fatigue specimens; The effect of surface roughness on the frequency of surface plasmons. GRA

N75-26395# Naval Postgraduate School, Monterey, Calif.
RELIABILITY ANALYSIS OF PHASED MISSIONS Ph.D. Thesis
Harald Ziehms Dec. 1974 66 p refs
(AD-A003781) Avail: NTIS CSCL 14/4

In a phased mission the relevant system configuration (block diagram or fault tree) changes during consecutive time periods or "phases". Many systems are required to perform phased missions; a classic example is a spacecraft. The reliability analysis of a phased mission encounters complexities not present with just one phase, but can be transformed into an analysis of an equivalent synthetic single-phase system. The transformation has a potential for direct application, but can also be used to study refined computational methods and to derive approximations to, and bounds on, mission reliability. GRA

N75-26396# Boeing Commercial Airplane Co., Seattle, Wash.
DETECTION OF CRACKS UNDER INSTALLED FASTENERS Final Report, 14 Feb. 1972 - 14 Feb. 1974
C. F. Raatz, R. A. Senske, and W. F. Woodmansee Apr. 1974 320 p refs
(Contract F33615-72-C-1205; AF Proj. 7351)
(AD-A004458; D6-60166; AFML-TR-74-80) Avail: NTIS CSCL 13/5

The overall objective of this 2-year program was the development of a reliable nondestructive method of detecting cracks under installed fasteners, emphasizing improvement of the ultrasonic shear wave method. The program included the implementation of the developed method into a system suitable for on-line inspection of airplanes. The development effort proceeded in four main areas: ultrasonic fastener-hole scanning techniques, display of test information, identification of transducer requirements, and portable-scanner design. GRA

N75-26397# Applied Science Associates, Inc., Denver, Colo.
COMPUTER GENERATED TROUBLESHOOTING TREES, APPLICATION AND TRYOUT Final Report
William J. Pieper, Allan J. Pinkus, and Donald L. Thomas Nov. 1974 91 p refs
(Contract F33615-72-C-1682)
(AD-A004634; AFHRL-TR-74-20(I)) Avail: NTIS CSCL 14/4

This report describes the results of a project to refine and test a procedure for developing troubleshooting trees by computer. In an earlier project conducted by NASA, a computer program and data preparation procedures were developed. However, the program and procedures were not fully tested. In this project, the procedures and program were refined, adapted, and tested. They were tested by using them to develop troubleshooting trees for a moderately complex electronic system. The troubleshooting trees were then evaluated by inserting faults into the equipment and using the trees to isolate the faults. Although the trees did not lead to isolation of 100% of the faults, the results did indicate that development of troubleshooting trees by computer is feasible. However, further refinements of the process are required before it can be used operationally. GRA

N75-26398# Boeing Vertol Co., Philadelphia, Pa.
ANALYSIS OF FACTORS AFFECTING TURBINE ENGINE RELIABILITY Final Report
K. G. Rummel and M. Byrne Nov. 1974 126 p refs
(Contract DAAJ02-73-C-0071; DA Proj. 1F1-62203-A-119)
(AD-A004016; D210-10812-1; USAAMRDL-TR-74-82) Avail: NTIS CSCL 21/5

The R and M problems of gas turbine engines were examined in a report entitled Investigation and Analysis of Reliability/Maintainability Problems Associated With Army Aircraft Engines. This study examines the Causal Factors which were identified as contributing to the R and M problems on current turbine engines and identifies and quantifies potential remedial actions which could improve future engine R and M characteristics. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-26399 British Library Lending Div., Boston Spa (England).
THE EFFECTS OF THE DISTRIBUTED MASSES OF THE SPACER ON THE VIBRATION MODES OF A MULTIPLE CONDUCTOR BUNDLE (ANALYSIS OF THE SPACER CHARACTERISTICS)
R. Claren 25 Jul. 1974 16 p refs Transl. into ENGLISH from L'Energia Elettrica (France), no. 1, 1972 p 10-17
(BLL-CE-TRANS-5938-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Methods used to determine the dynamic behavior of tensioned conductor bundles linked by elastic spacers are described. Data are given on bundle behavior when vibrations are either produced

by the galloping of the subspan or by separation of the vorticies. E.H.W.

N75-26400 British Library Lending Div., Boston Spa (England).
STRENGTH AND TOUGHNESS AS SAFETY CRITERIA FOR THE CONSTRUCTION OF APPARATUS
K. Kussmaul et al 29 Aug. 1974 21 p refs Transl. into ENGLISH from Z. Werkstofftech., v. 5, no. 1, 1974 p 1-8 (BLL-CE-Trans-6490-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The strength and toughness of materials used in the construction of pressure vessels and apparatus in the chemical processing industry is examined in terms of safety. It is indicated that the design, material, and processing must be optimized so that the stress (high pressure, high temperature, and corrosion) and the material characteristics are compatible. J.M.S.

N75-26401 Notre Dame Univ., Ind.
CREEP ANALYSIS OF STEEL STRUCTURES AT ELEVATED TEMPERATURES Ph.D. Thesis
Wun-Chau Cheng 1975 110 p
Avail: Univ. Microfilms Order No. 75-13082

An analytical procedure is presented for the creep deformation analysis of steel structures at elevated temperatures. An incremental variation principle is developed for an isotropic, work-hardening solid undergoing finite, quasi-static, elastoplastic, thermal, and creep deformations. Under the influence of an assumed temporal-spatial temperature distribution of the steel structure, the corresponding large displacement, thermal-creep deformation, and thermal-creep buckling behaviors of the steel structure are investigated by the incremental variational principle. The variational equation is integrated by finite element method in space and Euler method in time. Numerical results of ASTM A36 grade steel structures are compared with the available experimental fire test and simplified analytical results.
Dissert. Abstr.

N75-26402 Illinois Inst. of Tech., Chicago.
FINITE ELEMENT ANALYSIS OF NONLINEAR CABLE-REINFORCED MEMBRANES Ph.D. Thesis
Vijay Kumar Verma 1974 130 p
Avail: Univ. Microfilms Order No. 75-12823

A finite element model for the nonlinear static behavior of extremely thin, arbitrary shaped, cable-reinforced membrane shells was developed using curved elements. The governing stiffness equations are derived from the fully nonlinear theory of hyperelasticity, and no limitations are imposed on the magnitudes of displacements or strains. A curved quadrilateral element was used for the membrane and a curved line element for the cables. The nonlinear equations obtained were solved using a combined incremental and Newton-Raphson iterative technique. Several example problems are considered to validate and demonstrate the potential of the curved elements derived. For those example problems in which results were available by other exact or numerikal methods, close agreement with the results of the current model were obtained. Dissert. Abstr.

N75-26403 Colorado Univ., Boulder.
A THEORETICAL ANALYSIS OF THE DYNAMIC RESPONSE OF CONSTRUCTION CABLEWAY SYSTEMS Ph.D. Thesis
Kuen-Chun Tu 1974 204 p
Avail: Univ. Microfilms Order No. 75-13115

Mathematical models were generated of the cableway system which consists of the carriage, bucket, haul cable, hoist cable and main cable. Three models having discrete parameters were developed to analyze the dynamic response to the operation of the cableway systems. There are two sources of excitation: one is the haul excitation function which controls the horizontal movement of the carriage, and the other one is the hoist excitation function which controls the length of the hoist cable. The aim of the analysis is to select the excitation functions which will keep the operational times and the amplitudes of vibration response of the system within acceptable limits. Two special methods, called the 'natural period method' and the 'bilinear path method', were introduced and developed in a search for possible optimum paths to reduce the critical dynamic response of the bucket to acceptably small values at short operational times. An algorithm was developed to compute the dynamic response. Dissert. Abstr.

N75-26404 Stanford Univ., Calif.
AN EXPERIMENTAL STUDY OF THE BUCKLING PROCESS OF THIN-WALLED CYLINDERS AND THE ANALYSIS OF INELASTIC BUCKLING TEST DATA Ph.D. Thesis
Domenick Joseph Tenerelli 1974 331 p
Avail: Univ. Microfilms Order No. 75-13622

An experimental buckling study of thin-walled cylinders under axial compression is described. From the load versus lateral deflection plots of strategic locations on the shell wall the evidence is clear that a cylinder buckle pattern can be ascertained prior to specimen collapse. It is shown that straight lines result for certain points on a buckle. In all cases, the critical load derived from plotting data is close to the value at which the cylinder buckles. The techniques used and results obtained from a nondestructive test of a thin-walled cylinder under axial compression are reported. How the critical load and a strategic point in the buckling pattern were accurately predicted is described. The results of an experimental buckling study of thin-walled circular cylinders subjected to an axial compressive force and a uniform elevated temperature are reported. Dissert. Abstr.

N75-26405 Georgia Inst. of Tech., Atlanta.
SOME MIXED BOUNDARY VALUE PROBLEMS IN ELASTODYNAMICS Ph.D. Thesis
Stephen Edwin Scherer 1974 76 p
Avail: Univ. Microfilms Order No. 75-13007

An integral equation-variational procedure was used to characterize important quantities occurring in two distinct mixed boundary value problems of elastodynamics. In the first problem a low frequency approximation was obtained for the displacement of a flat rigid punch of elliptic cross-section undergoing vertical oscillations on the surface of an elastic half-space. In the second problem a stationary functional was constructed for the scattering cross-section for the diffraction, by a plane longitudinal wave, of a flat crack of arbitrary shape situated in an infinite elastic medium. Results are obtained for a circular crack.
Dissert. Abstr.

N75-26406 New York Univ., N.Y.
THE NONHOMOGENEOUS PLATE Ph.D. Thesis
Zin-Tzai Shi 1974 82 p
Avail: Univ. Microfilms Order No. 75-12469

The nonhomogeneous plate subjected to an arbitrary lateral load in the presence of thermal field was formulated from the principle of stationary potential energy in conjunction with the three dimensional theory of elasticity. The location of the reference plane was determined from a condition which simplifies the resulting formulation. The resulting differential equations for the in-plane stretching and lateral bending problem are uncoupled regardless of the distribution functions of E(z) and upsilon(z). The coupling of the boundary conditions will depend on the distribution of E(z) and upsilon(z). For an arbitrary distribution of E(z) and upsilon(z), the boundary conditions are uncoupled for the plate with the entire boundary clamped. The differential equation for the in-plane stretching problem is simplified by introducing the Airy stress function. An example is presented to demonstrate the application of the present plate formulation and study the effect of upsilon(z) on the stress distribution along the plate thickness. Dissert. Abstr.

N75-26407 Virginia Polytechnic Inst. and State Univ., Blacksburg.
FAILURE CRITERIA FOR LAYERED COMPOSITES Ph.D. Thesis
Vernon E. Oliver 1974 175 p
Avail: Univ. Microfilms Order No. 75-11946

An analysis is presented for predicting the response to failure of layered cylinders subjected to proportional loading in the load-torque space. An anisotropic shell, theory based on Vlasov's kinematic relations was used to predict the elastic response. An analytical model utilizing a reduced secant modulus to represent the post yield behavior of a layer is proposed. The model uses a five point Lagrange interpolation function to represent the basic lamina stress-strain relations. This representation together with a Hencky-type deformation theory was used to predict the redistribution of loads and the failure of subsequent

layers. Results are presented of an experimental program, in which cylinders with two isotropic layers were bonded together by an epoxy structural adhesive and subjected to combined loads and torques along radial load paths. Empirical data are compared with theoretical results based on several failure criteria for the case of two different isotropic layers. Dissert. Abstr.

N75-26408 Wayne State Univ., Detroit, Mich.
THE EFFECTS OF SHEAR AND EXTENSION ON THE STABILITY OF ELASTIC RODS Ph.D. Thesis
Jayant S. Mandke 1974 158 p refs
Avail: Univ. Microfilms Order No. 75-13362

Based on a three-dimensional nonlinear theory of rods, a theory of small deformations superposed on large deformations is formulated for the purpose of analyzing the stability of rods in the presence of extension and shear effects. A Cosserat curve, (a directed curve with three orthonormal rigid directors defined at each point of the curve) was used as the model of a rod. The theory includes the derivation of appropriate kinematic relations, strain measures, field equations, constitutive equations, and boundary conditions referring to the state of rod obtained by superposing perturbations on its initial state of large deformation. The theory is reduced to the special case of plane motions of initially curved and straight rods. The effects of shear and extension on the values of critical load parameters, for stability purposes, are studied for two problems: the Pfluger Problem and Greenhill's Problem. Dissert. Abstr.

N75-26409 West Virginia Univ., Morgantown.
STABILITY OF CLAMPED-ELASTICALLY SUPPORTED DAMPED TUBES CONVEYING PERIODICALLY FLOWING FLUID Ph.D. Thesis
Mohammed Sherif Talkhan Nouh 1974 193 p
Avail: Univ: Microfilms Order No. 75-12403

The effect is considered of external damping, internal energy dissipation, end support, and external axial flow on the stability of straight flexible tubes conveying steadily or periodically flowing fluid. The tubes are clamped at one end and elastically supported at the other. The equation of plane motion of the tube about the equilibrium position is derived using Hamilton's principle. Utilizing Galerkin's technique, the equation of motion is transformed to a system of ordinary differential equations. Two methods were used for the stability analysis. One method is based on a Liapunov transformation, requiring numerical integration of the equations of motion, and the other is an extension of Hill's method. It is shown that the generalized Hill's determinant can be expressed in a closed form constituting the characteristic equation for the system. The roots of the characteristic equation were located using a method based on the argument principle in complex variable analysis. The results of the numerical stability analysis are presented as limiting curves. Dissert. Abstr.

N75-26410 Polish Academy of Sciences, Warsaw.
FAILURE MECHANICS [TEORIA ZNISZCZENIA]
A. M. Freudenthal 9 Jul. 1974 104 p In POLISH
(Rept-51/1974) Avail: Issuing Activity

The boundary load-carrying capacity state of construction elements was investigated along with their elasticity and strength. Other topics discussed include linear-elastic theory of failure, material properties, hardness, thick walled shells, ceramic materials, high strength materials, brittle materials, boundary value problems, crystal defects, tensile strength, and stress analysis. Transl. by M.J.S.

N75-26411 Polish Academy of Sciences, Warsaw.
OPTIMALIZATION OF GRID PLATES [OPTYMALIZACJA PLYT SIATKOWYCH]
Jacek Gierlinski 13 Feb. 1975 144 p refs In POLISH
Avail: Issuing Activity

Flat grid structures are discussed including grid plates, grids, grid disks, and disk-plate structures. Conditions of optimization regarding flat structures were determined by considering the rigidity of rods to torsion and the influence of lateral forces on deformation. Optimization conditions are also analyzed for grid plates, and are illustrated with examples of solution of optimalization problems. Computer-aided design and optimization of structures is considered. Transl. by M.J.S.

N75-26412*# George Washington Univ., Washington, D.C. School of Engineering and Applied Sciences.
LARGE AMPLITUDE FLEXURAL VIBRATION OF THIN ELASTIC FLAT PLATES AND SHELLS
K. A. V. Pandalia [1972] 89 p refs
(Grant NGR-09-010-053)
(NASA-CR-112164) Avail: NTIS HC $4.75 CSCL 20K

The general equations governing the large amplitude flexural vibration of any thin elastic shell using curvilinear orthogonal coordinates are derived and consist of two coupled, nonlinear, partial differential equations in the normal displacement w and the stress function F. From these equations, the governing equations for the case of shells of revolution or flat plates can be readily obtained as special cases. The material of the shell or plate is isotropic and homogeneous and Hooke's law for the two-dimensional case is valid. It is suggested that the difference between the hardening type of nonlinearity in the case of flat plates and straight beams and the softening type of nonlinearity in the case of shells and rings can, in general, be traced to the amount of curvature present in the underformed median surface of the structure concerned. Author

N75-26413# Shock and Vibration Information Center (Defense), Washington, D.C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 6, NO. 11
Nov. 1974 80 p refs
(AD-A003450) Avail: NTIS HC $4.75

Abstracts on shock and vibration are presented for the following subjects: wave propagation in viscoelastic solids; analytical methods and design; acoustic, periodic, shock, and seismic environments; phenomenology; experimentation; vibration absorbers and structural effects; and, acoustic isolation. L.B.

N75-26414*# General Dynamics/Convair, San Diego, Calif.
DESIGN, FABRICATION, AND TEST OF A GRAPHITE/EPOXY METERING SHELL (GEMS) Final Report, Jun. 1973 - Apr. 1975
Apr. 1975 187 p
(Contract NAS8-28201)
(NASA-CR-143870; CASD-NAS-75-015) Avail: NTIS HC $7.00 CSCL 11D

A program to design, fabricate and test a dimensionally stable metering structure in support of the large space telescope (LST) program is discussed. Graphite/epoxy was the material selected as the only viable candidate material which can meet the stringent thermal expansion criteria of the LST. A metering shell was designed and fabricated, with emphasis on dimensional stability in conjunction with low cost. Thermal expansion test coupons extracted from the layups of the skin panels indicated the attainment of a coefficient of thermal expansion of 0.0666 micrometers/m K. Subsequent thermal vacuum chamber tests on the complete metering shell demonstrated an expansion of the 2.95-meter overall length of 0.27 micrometers/K. Static and dynamics tests, which demonstrated adequacy with respect to limit loads and stiffness, were also accomplished. Author

N75-26415*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VIBRATION RESPONSES OF TEST STRUCTURE NO. 2 DURING THE EDWARD AIR FORCE BASE PHASE OF THE NATIONAL SONIC BOOM PROGRAM
Donald S. Findley, Vera Huckel, and Harvey H. Hubbard Jun. 1975 35 p ref
(NASA-TM-X-72704) Avail: NTIS HC $3.75 CSCL 13B

In order to evaluate reaction of people to sonic booms of varying overpressures and time durations, a series of closely controlled and systematic flight tests/studies were conducted from June 3 to June 23, 1966. The dynamic responses of several building structures were measured, with emphasis on a two-story residence structure. Sample acceleration and strain recordings from F-104, B-58, and XB-70 sonic boom exposures are included, along with tabulations of the maximum acceleration and strain values measured for each one of about 140 flight tests. These data are compared with similar measurements for engine noise exposures of the building during simulated landing approaches and takeoffs of KC-135 aircraft. Author

N75-26416*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

STRUCTURAL EVALUATION OF CANDIDATE DESIGNS FOR THE LARGE SPACE TELESCOPE PRIMARY MIRROR Research Report, 1 Jan. - 1 Sep. 1974

Keto Soosaar, Roland Grin, Martin Furey, and Joseph Hamilton Apr. 1975 173 p refs

(Contract NAS8-29187; Proj. 55-52100)

(NASA-CR-143880; R-874) Avail: NTIS HC $6.25 CSCL 20K

Structural performance analyses were conducted on two candidate designs (Itek and Perkin-Elmer designs) for the large space telescope three-meter mirror. The mirror designs and the finite-element models used in the analyses evaluation are described. The results of the structural analyses for several different types of loading are presented in tabular and graphic forms. Several additional analyses are also reported: the evaluation of a mirror design concept proposed by the Boeing Co., a study of the global effects of local cell plate deflections, and an investigation of the fracture mechanics problems likely to occur with Cervit and ULE. Flexibility matrices were obtained for the Itek and Perkin-Elmer mirrors to be used in active figure control studies. Summary, conclusions, and recommendations are included.

Author

N75-26417*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

ANALYSIS AND TRADE-OFF STUDIES OF LARGE LIGHT-WEIGHT MIRROR STRUCTURES

Keto Soosaar, Roland Grin, and Francois Ayer Apr. 1975 150 p refs

(Contract NAS8-29187)

(NASA-CR-143881; R-873) Avail: NTIS HC $5.75 CSCL 20K

A candidate mirror, hexagonally lightweighted, is analyzed under various loadings using as complete a procedure as possible. Successive simplifications are introduced and compared to an original analysis. A model which is a reasonable compromise between accuracy and cost is found and is used for making trade-off studies of the various structural parameters of the lightweighted mirror.

Author

N75-26418# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

DYNAMIC RESPONSE OF LAMINATED COMPOSITE PLATES

Chang-Tsan Sun (Iowa State Univ.), J. M. Whitney, and L. Whitford (ASD) 8 Oct. 1974 36 p refs Backup document for AIAA Synoptic scheduled for publication in the AIAA Journal in Oct. 1975

Avail: NTIS HC $3.75

A classical method of separation of variables is employed to analyze the dynamic response of an infinitely long simply-supported composite plate under a uniform dynamic pressure on the upper surface of the plate. Two cases of dynamic pressure are considered: (1) the magnitude of the uniform pressure remains unchanged, and (2) the magnitude of the uniform pressure increases linearly as a function of time and then remains constant. Numerical results for eight layer graphite-epoxy and glass-epoxy composites and stacking sequences are evaluated. Dynamic response characterized in terms of normal displacement, bending stress, interlaminar shear stress, and interlaminar normal stress is evaluated and compared with corresponding quantities obtained statically. Results show that the dynamic values are consistently twice the corresponding static values for case one, and vary from one to two times the corresponding static values for case two.

Author

N75-26419# Oxford Univ. (England). Dept. of Engineering Science.

ON FITTING YIELD AND PLASTIC POTENTIAL FUNCTIONS TO EXPERIMENTAL RESULTS

B. Dodd and D. A. Scivier Nov. 1974 27 p refs

(Ouel-1111/74) Avail: NTIS HC $3.75

A plastic potential function was used to fit Taylor and Quinney's experimentally determined Lode variables. The fits were compared with those of Drucker and Prager.

ESRO

N75-26420# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugzeugbau.

STIFFNESS COEFFICIENTS OF PLATES WITH INTEGRAL STIFFENERS Ph.D. Thesis - Brunswick Univ.

Klaus Rohwer 1975 187 p refs In GERMAN; ENGLISH summary

(DLR-FB-75-07) Avail: NTIS HC $7.00; DFVLR, Porz, West Ger. 59.70 DM

As part of the theory, the stiffened plate is divided into regions; the load-deflection behavior of each region represents that of the whole plate. This representative region is analyzed numerically. The results are summarized in empirical formulas. Buckling loads bared on the presented technique for stiffness coefficients are compared with those of earlier techniques.

Author (ESRO)

N75-26421# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.

DYNAMIC PLASTIC BUCKLING OF RINGS AND CYLINDRICAL SHELLS

Norman Jones and D. M. Okawa Oct. 1974 65 p refs

(Contract N00014-67-A-0204-0032; MIT Proj. DSR-71588)

(AD-A003587; Rept-74-18) Avail: NTIS CSCL 20/11

An experimental investigation was undertaken into the dynamic plastic buckling of circular rings subjected to uniformly distributed external impulsive velocities. The experimental values of the average final radial deflections, critical mode numbers and dimensions of the permanent wrinkles in the mild steel and aluminum specimens are compared with various theoretical predictions and other experimental results.

GRA

N75-26422# Waterloo Univ. (Ontario). Dept. of Civil Engineering.

STUDIES ON BASIC MECHANISMS OF STRUCTURAL FATIGUE Final Report, 15 Jul. 1971 - 14 Jul. 1974

T. H. Topper and J. F. Martin Sep. 1974 22 p refs

(Grant AF-AFOSR-2120-71; AF Proj. 9782)

(AD-A003830; AFOSR-74-1911TR) Avail: NTIS CSCL 11/6

A cumulative fatigue damage procedure has been developed that can be used to predict the fatigue lives of notched components. This procedure is restricted to situations where time-dependent effects and multiaxial stress states do not effect the structure being analysed. It has been shown that smooth uniaxial specimens can be used to simulate both the stress-strain and the fatigue behavior of the material at the critically deformed region. Computer models of uniaxial stress-strain response have been incorporated into cumulative damage procedures to predict the failure of notched plates and beams. Basic research has been carried out in the areas of biaxial and high temperature stress-strain and fatigue behavior. Preliminary biaxial specimen designs are complete and new equipment has been acquired for further testing of smooth biaxial specimens that can be subjected to tension-compression loading and internal-external pressure. An analytical expression has been developed for the fatigue notch factor that accounts for biaxial stresses.

GRA

N75-26423# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

A STUDY OF ELASTIC-PLASTIC ANALYSIS BY THE ASSUMED STRESS HYBRID FINITE ELEMENT MODEL, WITH APPLICATION TO THICK SHELLS OF REVOLUTION Final Report

Robert L. Spilker Dec. 1974 385 p

(Contract DAAG46-73-C-0173; DA Proj. 1W5-64603-D-385)

(AD-A004027; ASRL-TR-175-1; AMMRC-CTR-74-71) Avail: NTIS CSCL 20/11

Two numerical methods have been developed, using the assumed-stress hybrid finite-element model as a basis, for the elastic-plastic, small deflection analysis of structures under static loading. The two approaches chosen: the initial-strain approach and the initial stress-approach, result in a set of linear incremental simultaneous algebraic equations to be solved for each increment in applied external loading, with the global stiffness matrix remaining unchanged throughout the loading process and the effects of plasticity included as equivalent loading.

GRA

N75-26424# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab

AN ASSUMED STRESS HYBRID FINITE ELEMENT FOR THREE-DIMENSIONAL ELASTIC STRUCTURAL ANALYSIS Interim Report

Sung Won Lee May 1974 111 p refs

(Contract F44620-72-C-0018; AF Proj. 9782)

(AD-A004139; ASRL-TR-170-3; AFOSR-75-0087TR) Avail: NTIS CSCL 20/11

An eight-node isoparametric hexahedral element based on the assumed stress hybrid approach is developed for three dimensional elastic structural analysis. The assumed stresses are represented by 24 unknown parameters. Two different ways of treating body forces are discussed and compared. A scheme of decomposing the assumed stress field to deal with incompressible or nearly incompressible material is also presented. Several example problems were solved to investigate the performance of the present element. GRA

N75-26425# Army Materials and Mechanics Research Center, Watertown, Mass.

AN APPLICATION OF FRACTURE MECHANICS TO STRUCTURAL ANALYSIS Final Report

Joseph I. Bluhm Nov. 1974 10 p refs

(DA Proj. 1T1-61101-A-91A)

(AD-A003998; AMMRC-TR-74-31) Avail: NTIS CSCL 20/11

Deflections of structural elements are frequently determined using simple engineering strength of materials approaches. However, when geometric discontinuities are present, such approaches may lead to excessive errors in the predicted deflection. The present paper suggests a simple technique for refining these deflection predictions using available fracture mechanics data. Use of such techniques leads to predictions which do not differ significantly from exact solutions. GRA

N75-26426# Naval Ship Research and Development Center, Bethesda, Md.

A SURVEY OF PRE- AND POSTPROCESSORS FOR NASTRAN

Gordon C. Everstine and James M. McKee Jun. 1974 26 p refs Presented at the Intern. Symp. on Struct. Mech. Software, College Park, Md., 12-14 Jun. 1974

(ZF0990101)

(AD-A004177; NSRDC-4391) Avail: NTIS CSCL 09/2

This paper surveys various preprocessors and postprocessors developed for use with the NASA Structural Analysis Computer Program, NASTRAN. The following topics are included in the survey: automatic data generation, data checking and updating, conversion of data to NASTRAN format, contour plotting, NASTRAN's General Purpose Plotter (NASTPLT), data transfer utilities, transient response to input accelerations, rigid links, processors for vehicle dynamics, antenna radiation, and structural modification reanalysis. GRA

N75-26427# California Univ., Los Angeles. School of Engineering and Applied Science.

GLOBAL-LOCAL FINITE ELEMENT STRUCTURAL ANALYSIS, ANALYTICAL CONSIDERATIONS/ELEMENT FORMULATION Final Report, Apr. 1973 - Oct. 1974

Stanley B. Dong Oct. 1974 53 p refs

(Contract N62399-73-C-0020; DNA Proj. NWET-Y99QAXS; YF00808)

(AD-A003936; UCLA-ENG-7466; CEL-CR-75.002) Avail: NTIS CSCL 20/11

The analytical developments for a computer code based on the concept of Global-Local Finite Elements are presented in this report. In this type of analysis, both the classical Ritz and the finite element approaches are used simultaneously. The role of the global functions will be to capture the bulk of the response while the finite elements provide the necessary adjustments to satisfy whatever local geometric and material property variations that exist. GRA

N75-26428# Cambridge Acoustical Associates, Inc., Mass.

CURVATURE DEPENDENCY OF PROPAGATING WAVES IN POINT-EXCITED SPHERICAL AND CYLINDRICAL SHELLS SUBMERGED AND IN VACUO

Jeremy Schwartz Aug. 1974 46 p refs

(Contract N00014-69-C-0096; NR Proj. 185-301)

(AD-A004645; CCA-V-457-210) Avail: NTIS CSCL 20/1

Geometrical acoustics solutions, which exhibit dependency on the shell curvature, are derived from the exact travelling wave representation for spherical and circular cylindrical shells, submerged and in vacuo. For submerged shells the curvature effect is of the order of the inverse of the wave radius, ka, while for shells in vacuo it is of the order of the square of the inverse of the wave radius. In the further approximation of small wave thickness, kh, the solutions obtained here for shells in vacuo satisfy the eikonal and transport equations determined by O. A. Germogenova for shells in vacuo. In addition, in this further approximation, although the energy transport vector is not normal to the phase front in general, it is always tangential to a geodetic path on the shell surface. Basics for the development of ray geometrical theories of the Keller type are indicated. GRA

N75-26429# Naval Postgraduate School, Monterey, Calif.

STIFFNESS OF STEPPED BARS M.S. Thesis

Dennis Michael Doyle Dec. 1974 80 p refs

(AD-A004251) Avail: NTIS CSCL 20/11

The stiffness of stepped bars is determined by calculating deflections due to applied loads using the finite element method. Nine combinations of step height and fillet radius are studied for each of the following cases: Rectangular cross section under axial load; rectangular cross section under bending load; circular cross section under axial load; and circular cross section under torsional load. A correction parameter, actually a fictitious axial displacement of the step, is derived. It makes possible accurate calculation of deflections of stepped bars using elementary formulas. GRA

N75-26430# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

NONLINEAR PARAMETRIC VIBRATIONS OF CLOSED CYLINDRICAL SHELLS

A. S. Volmir and A. T. Ponomarev 11 Dec. 1974 14 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekhan. (Moscow), v. 26, no. 2, 1973 p 44-50

(AD-A004440; FTD-HC-23-1711-74) Avail: NTIS CSCL 20/11

The article discusses nonlinear parametric vibrations of closed, circular shells supported on a hinge, stimulated by a pulsating load acting in an axial direction. GRA

N75-26431# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON FRONTAL DISRUPTIONS STIMULATED BY PRESSURE WAVES IN SHELLS

M. E. Kutser and U. K. Nigul 11 Dec. 1974 14 p refs Transl. into ENGLISH from Tr. Vses. Konf. po Teorii Obolochek i Plastin (Erevan), Oct. 1962 p 340-345

(AD-A004350; FTD-HC-23-1506-74) Avail: NTIS CSCL 20/11

Arrangements and intensities were determined for frontal discontinuities of the solution to a linear hyperbolic system of equations. These equations describe the Timoshenko-type theory of plane and axisymmetric wave processes of elastic shell deformation resulting from pressure wave loads propagating over the shell surface with diminishing velocity. It is assumed that at some initial stage, the velocity of the pressure wave significantly exceeds at least one of the velocities of wave propagation. M.J.S.

N75-26432# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHOD OF DEVELOPING A CHANGE IN THE ANISOTROPY OF THE PROPERTIES OF FILMS OF POLYTETRAFLUOROETHYLENE (PTFE) AFTER A SHOCK LOAD

N. G. Vinogradova and A. I. Pavlov 19 Dec. 1974 14 p Transl. into ENGLISH from the monograph "Metallovedenie i Prochnost Materialov. Trudy Volgogradskogo Politekhnicheskogo Instituta" Volgograd, 1970 p 265-272

(AD-A004351; FTD-HC-23-1580-74) Avail: NTIS CSCL 20/12

A change in the anisotropy of the properties of polymer materials can take place as a result of heating or stretching. With an intensive shock compression as a function of the load

diagram, both heating and stretching of the material may take place. There was interest in conducting research to clarify the influence of shock loading upon the change in anisotropy of polymer properties and of the factors that influence it. In connection with this, the necessity arose for developing a research method most closely corresponding to the loading conditions to enable one to detect the change in both structure and mechanical properties. GRA

N75-26433# Alabama Univ., Huntsville. School of Graduate Studies and Research.

THEMIS FINAL REPORT. VOLUME 1. BASIC RESEARCH IN METHODS OF APPROXIMATION IN THE NONLINEAR MECHANICS OF SOLIDS AND STRUCTURES

J. H. Brauchli, T. J. Chung, T. L. Cost, J. T. Oden, G. Weeks, and G. A. Wempner Oct. 1974 113 p

(Contract F44620-69-C-0124; AF Proj. 9782)

(AD-A003713; UAH-RR-161-Vol-1; AFOSR-75-0047TR) Avail: NTIS CSCL 20/11

A summary of five-year THEMIS research projects on continuum theories and methods of approximations in the broad spectrum of nonlinear mechanics is contained herein. Only the brief descriptions of research and published articles are presented in this volume. GRA

N75-26434# Alabama Univ., Huntsville. School of Graduate Studies and Research.

THEMIS FINAL REPORT. VOLUME 2. NONLINEAR MECHANICS IN SOLIDS AND STRUCTURES

T. J. Chung Oct. 1974 169 p refs

(Contract F44620-69-C-0124; AF Proj. 9782)

(AD-A003714; UAH-RR-162-Vol-2; AFOSR-75-0048TR) Avail: NTIS CSCL 20/11

This report presents theories and numerical analysis for a number of nonlinear problems in solids and fluids carried out during the final year of the THEMIS Project. Stability and convergence of nonlinear finite element equations are discussed. Applications to the finite strain plasticity, thermoviscoplastic fiber composites, endochronic theory, and dynamic stability have been demonstrated. Various fluid mechanics problems such as incompressible, compressible, inviscid, and viscous flows, rotational and boundary layer flows have been solved using the finite element methods. GRA

N75-26435# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A STRESS INTENSITY FACTOR CALIBRATION FOR CORNER FLAWS AT AN OPEN HOLE M.S. Thesis

Johnny R. Snow Dec. 1974 90 p refs

(AD-A004799; GAE/MC/74-13) Avail: NTIS CSCL 20/12

The fatigue crack growth test was used to investigate corner flaws at holes in polymethylmethacrylate plates loaded in uniform, cyclic tension. Using baseline data and Paris' relationship, a calibration of stress intensity factor for the constant thickness, constant hole diameter specimens was made. In general, this study demonstrated lower stress intensity at the hole and higher stress intensity at the surface for larger crack sizes when compared to other researchers. It was concluded that fatigue crack growth rate testing with PMMA is a useful method of obtaining stress intensity factor calibrations for complex, three-dimensional problems where no exact solutions exist. GRA

N75-26436# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

AN EVALUATION OF THE EFFECTS OF CYCLIC LOADING ON THE STRENGTH OF ZINC SELENIDE

Gordon R. Atkins Nov. 1974 17 p ref

(AF Proj. 7371)

(AD-A004766; AFML-TR-74-108) Avail: NTIS CSCL 20/12

An investigation of the possible effects of cyclic loading on the strength of chemically vapor deposited zinc selenide was conducted. Experimental results indicate no apparent reduction in strength due to cyclic loading. GRA

N75-26437# Brown Univ., Providence, R.I. Engineering Materials Research Lab.

ON AN EXTREMUM PRINCIPLE FOR MODE FORM SOLUTIONS IN PLASTIC STRUCTURAL DYNAMICS

Paul S. Symonds and Tomasz Wierzbicki Nov. 1974 50 p refs

(Contract N00014-67-A-0190-0003; Grant NSF GA-33631)

(AD-A004294) Avail: NTIS CSCL 20/11

An extremum principle of Lee and Martin, for mode form solutions of a structure deforming plastically as result of dynamic loading, is discussed with special reference to conditions for the extrema to be stationary, with vanishing first variation of a functional of kinematically admissible velocity fields. Three classes of material behavior are treated: rigid-perfectly plastic, rigid-viscoplastic, and viscous, the last having no yield function. The authors illustrate various forms of these which are realistic as well as convenient in problems of plastic dynamics of structures. For all three classes of material, the authors show that stationary extrema occur under certain conditions, but may be regarded as exceptional. The properties of the extrema for structures are illustrated by means of a simple discrete structure model with two masses. GRA

N75-26438# California Univ., Berkeley. Dept. of Chemical Engineering.

DYNAMIC MECHANICAL AND MORPHOLOGICAL STUDIES OF HOMOPOLYMER/BLOCK COPOLYMER BLENDS

L. Toy, M. Niinomi, and M. Shen 15 Jan. 1975 35 p refs

(Contract N00014-69-A-0200-1053; NR Proj. 356-526)

(AD-A004643; TR-12) Avail: NTIS CSCL 20/12

A triblock copolymer of styrene-butadiene-styrene (SBS) was blended with a high and a low molecular weight polybutadiene (designated as PB(H) and PB(L) respectively). Electron micrographs of these blends show that PB(L) was solubilized into the butadiene domains of the SBS; while PB(H) was present in a separate phase. Dynamic mechanical data of the SBS/PB(L) blends indicate the presence of an intermediate loss peak between those of the glass transitions of the styrene and butadiene blocks in SBS, which can be attributed to the slippage of untrapped entanglements of PB(L) chains. Similar data for blends containing PB(H) also shows an intermediate loss peak, which is, however, due to crystallization and melting of the poly-cis-butadiene chains. Dynamic mechanical data for crosslinked blends were also taken for comparison. GRA

N75-26439# Bureau of Mines, Denver, Colo. Mining Research Center.

A NEW METHOD OF ANALYSIS TO OBTAIN EXACT SOLUTIONS FOR STRESSES AND STRAINS IN CIRCULAR INCLUSIONS Final Report of Investigations, 1973 - 1974

Clarence O. Babcock Dec. 1974 45 p refs

(PB-240142/0; BM-RI-7967) Avail: NTIS HC $3.75 CSCL 08I

This report presents the initial development of a two-dimensional method of analysis for inclusions in plates in which the deformed shape of an open hole and the separate structural behavior of inclusion and plate with hole are used to obtain the stresses and strains in the inclusion only. The solution for a circular inclusion is presented and a direct verification of the results with previous solutions was possible. The numerical results were in exact agreement with those obtained with the equations of Sezawa and Donnell. The equations developed are less complex than those of Sezawa and more general, for a circular inclusion, than those of Donnell. GRA

N75-26440# Bureau of Mines, Spokane, Wash. Mining Research Center.

DEVELOPMENT OF TITANIUM LOAD CELLS FOR SUPPORT LOAD DETERMINATION

Michael J. Beus and Earl L. Phillips Nov. 1974 41 p refs

(PB-240148/7; BM-RI-7972) Avail: NTIS HC $3.75 CSCL 08I

The development of load cells is described for measuring compressive loads in timber and rock-bolt support systems commonly used in coal, metal, and nonmetal mines. Design and evaluation is covered in detail. The load cells are relatively inexpensive and adaptable to various size support systems. User oriented procedures are emphasized and design equations were reduced to a series of nomographs. Laboratory evaluation, destructive testing, environmental testing, and tests to determine the effect of extraneous loads were conducted. GRA

42 GEOSCIENCES (GENERAL)

N75-26441# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 3, 1975
30 Jun. 1975 179 p refs Transl. into ENGLISH of Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 3-115, 118-120 (JPRS-65111) Avail: NTIS HC $7.00

Articles are presented on microclimate, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, and the activities and personnel of the Soviet Hydrometeorological Service. For individual titles, see N75-26442 through N75-26455.

N75-26442 Joint Publications Research Service, Arlington, Va.
CIRCULATION INDEXES FOR DIFFERENT PHASES OF THE QUASIBIANNUAL WIND CYCLE IN THE EQUATORIAL STRATOSPHERE c47
Kh. P. Pogosyan and A. A. Pavlovskaya *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 23-32 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 19-26 (For availability see N75-26441 17-42)

The results are presented from a quantitative estimate of the perturbation of the zonal circulation in the intratropical latitudes of the Northern Hemisphere during the periods of the westerly and easterly phases of the quasibiannual cycle using various indexes. A circulation index based on considering the anomalies of the atmospheric processes on the scale of the hemisphere or in individual large regions of it is proposed. The calculations made demonstrated that in the hemisphere as a whole the zonal circulation predominates, but in the easterly phase of the quasibiannual cycle the meridional processes are somewhat more developed than in the westerly phase. Author

N75-26443 Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN THE INTERACTION OF THE WEATHER FORECASTER WITH A COMPUTER FOR NUMERICAL FIVE-DAY TOTAL PRECIPITATION FORECASTING c47
A. L. Kats *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 33-40 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 27-32 (For availability see N75-26441 17-42)

A version of improving the existing system for numerical forecasting of the 5-day precipitation totals on the basis of the man machine technique is discussed. Author

N75-26444 Joint Publications Research Service, Arlington, Va.
DIURNAL VARIATION OF THE METEOROLOGICAL ELEMENTS IN THE STRATOSPHERE c47
K. T. Logvinov *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 41-53 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 33-42 (For availability see N75-26441 17-42)

Data from frequent rocket measurements at weather stations located in various latitudinal zones are used to study the diurnal variations of the temperature, the zonal, and the meridional wind components in the stratosphere. It is demonstrated that the variations of meteorological parameters which predominate are those caused by variations in the influx of solar radiation during a 24 hour period. Author

N75-26445 Joint Publications Research Service, Arlington, Va.
CALCULATING THE AEROSOL ATTENUATION INDEX c47
K. A. Tavartkiladze *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 54-61 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 43-49 (For availability see N75-26441 17-42)

A numerical method is proposed for solving the equation of the integral intensity flux of the direct radiation in determining the optical thickness of the atmospheric aerosols. An example is given of calculating the optical thickness of the atmospheric aerosols based on the data from the Urals complex experiment (CENEX-71). Author

N75-26446 Joint Publications Research Service, Arlington, Va.
CALLING ON SATELLITE AND FORECASTING DATA FOR OBJECTIVE ANALYSIS c47
V. A. Shakhmeyster *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 62-72 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 50-57 (For availability see N75-26441 17-42)

The problem of using satellite and forecasting data as additional information for objective analysis is examined. A series of numerical experiments were performed in which the distribution of the mean square errors of the objective analysis was obtained with respect to the hemisphere using additional information. It is concluded that the accuracy of the objective analysis can be improved in regions with a sparse aerological station network by using satellite and forecasting data. Author

N75-26447 Joint Publications Research Service, Arlington, Va.
NUMERICAL SIMULATION OF TURBULENT EXCHANGE OF A TWO-PHASE STRATIFIED FLOW IN A CHANNEL c34
M. I. Zheleznyak *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 73-85 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 58-67 (For availability see N75-26441 17-42)

The results obtained for a suspension-bearing turbulent flow in a channel are generalized. Numerical models distinguished by the hypothesis for the characteristic size of the vortexes and the boundary conditions are analyzed. The optimal statement of the problem for a uniform liquid is extended to the case of a two-phase turbulent flow. It is demonstrated that the proposed model permits the velocity distribution of the flow, the suspension, and the turbulence parameters to be obtained with a sufficient degree of accuracy by the given values of the basic flow characteristics. Author

N75-26448 Joint Publications Research Service, Arlington, Va.
EXTRAORDINARY SWELLS c48
G. V. Rzheplinskiy, G. V. Matushevskiy, and L. A. Yeshchenko *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 86-93 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 68-73 (For availability see N75-26441 17-42)

Fluctuations of the surface atmosphere pressure in the vicinity of a cold front moving over the sea are found to be the source of large swells on the Caucasian coast of the Black Sea. The characteristics of these 'frontal' waves (the spectra, the heights, the periods) and the theoretical arguments regarding the resonance mechanism of their generation are presented. Author

N75-26449 Joint Publications Research Service, Arlington, Va.
HEAT BALANCE OF THE SEA OF JAPAN AT THE BEGINNING OF THE SPRING WARMUP c48
V. V. Pokudov and V. P. Tunegolovets *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 94-107 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 74-84 (For availability see N75-26441 17-42)

The heat budget of the sea surface and the heat transfer by the currents was studied. It is demonstrated that at the end of March the defining components in the heat budget are the radiation component in the western part of the sea and the heat lost by the sea as a result of evaporation, in the east. It is found that the beginning of the spring heating comes earlier in the western and southern parts of the sea. Author

N75-26450 Joint Publications Research Service, Arlington, Va.
THEORY OF HYDROMORPHOLOGICAL RELATIONS FOR STABLE CHANNELS c48
G. T. Tagaymuradov and Yu. V. Chernov *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 108-118 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 85-92 (For availability see N75-26441 17-42)

The possible versions of constructing the hydromorphological relations characterizing the stability of river channels are investigated. Author

N75-26451 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE AIR HUMIDITY AND TEMPERATURE ON THE TEA LEAF HARVEST IN THE SUBTROPICAL ZONE

OF KRASNODAR KRAY c47
P. M. Bushin *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 119-128 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 93-100 (For availability see N75-26441 17-42)

The relation between the air temperature and the growth of the tea shoots in the spring was studied. The relation between the tea leaf harvest and the relative humidity and the humidity deficit during the summer shoot formation period (July-September) is demonstrated. Author

N75-26452 Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN COMPARING THE SATELLITE AND GROUND CLOUD DATA c47
A. F. Dyubyuk, V. M. Berezin, T. N. Bibikova, and Ye. V. Zhurba *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 129-135 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 101-104 (For availability see N75-26441 17-42)

The theoretical possibility of comparing cloud photographs obtained from meteorological satellites and from the ground is demonstrated in the example of cloud photographs in Crimea. Author

N75-26453 Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF COMPUTER PROCESSING OF TELEMETRIC DATA c60
Kh. N. Gaynanov, Yu. V. Neyman, and A. I. Rykov *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 136-150 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 105-113 (For availability see N75-26441 17-42)

Computer processing of the results from temperature sounding of the atmosphere obtained by the RKZ type radiosondes is investigated. A procedure is proposed for analytical representation of the resistance as a function of temperature fr the MMT thermoresistors used as the temperature sensors in the RKZ radiosonde. The analytical approximation of the temperature calibration characteristic of the radiosonde and significant simplification of the procedure for input of this characteristic to the computer is examined. Results are discussed. Author

N75-26454 Joint Publications Research Service, Arlington, Va.
NEW METHOD OF OBSERVING ICE PHENOMENA ON THE RIVERS AND RESERVOIRS c46
B. M. Ginzburg, Yu. V. Nalimov, and M. B. Ponomarev *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 151-153 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 114-115 (For availability see N75-26441 17-42)

The experimental results are discussed which indicate the possibility of using the Toros aircraft radar system for observations of ice phenomena on rivers and reservoirs. Author

N75-26455 Joint Publications Research Service, Arlington, Va.
MACROCIRCULATION METHOD OF LONG-RANGE METEOROLOGICAL FORECASTING c47
V. I. Vorobyev and I. M. Dolgin *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 158-162 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 118-120 (For availability see N75-26441 17-42)

The state of the art of long-range meteorological forecasting is reviewed with emphasis on the macrocirculation method. Characteristics of the basic forms of atmospheric circulation are investigated along with the principles and criteria for determining the various forms of atmospheric circulation. The need for further development in this area is indicated. Author

43 EARTH RESOURCES

Invludes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-26456 Miami Univ., Coral Gables, Fla.
AN EVALUATION OF THE USE OF THE EARTH RESOURCES TECHNOLOGY SATELLITE FOR OBSERVING OCEAN CURRENT BOUNDARIES Ph.D. Thesis
George August Maul 1974 117 p
Avail: Univ. Microfilms Order No. 75-12880

Remote sensing of ocean color to locate current boundaries was tested in the eastern Gulf of Mexico. A one year time history of the Gulf Loop Current was made by ship in synchronization with the LANDSAT satellite. The LANDSAT images indicate that the current's boundary can be detected by changes in either color or sea state. Theoretical spectra of upwelling irradiance confirm that surface reflectance changes due to meteorological conditions spectrally alter LANDSAT radiances. The gain settings for the satellite are not optimized for ocean radiances and computer enhancement of the data are required. The ship data demonstrate an annual cycle of growth, eddy separation, and decay of the Gulf Loop Current, which could not be reproduced with LANDSAT due to the 18 day orbit cycle and because the sensors were not designed for ocean radiance levels or spectral distributions. It is shown that a visible multispectral scanner, which supplies at least daily observations, is capable of providing tri-weekly pathlines of the Gulf Loop Current. Dissert. Abstr.

N75-26457*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, May 1975
LeRoy F. Silva, Principal Investigator May 1975 3 p ref EREP
(Contract NAS9-13301)
(E75-10313; NASA-CR-142915) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Analysis of the digitized SL/4 S190A color IR photography proved very difficult. An area within Allen County, including Ft. Wayne, was studied. Eight segments of the study area were clustered separately and the cluster maps were then compared with the photography and maps available. The training areas for the land use classes were selected from the cluster maps. The separability measures (transformed divergence) of the classes indicated that many of the land use classes were not spectrally separable. The classification results bore this out. Visually the resulting classification map was poor, with 67 percent correct data. These results were of significantly lower quality than those obtained for the summertime SL/2 data near Lake Monroe, Indiana. Low contrast between land use classes during the wintertime and the limited spectral range and resolution are the major causes for the poor performance.

N75-26458*# Maryland Geological Survey, Baltimore.
RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND Final Report
Kenneth N. Weaver, Principal Investigator, William P. Crowley, Jonathan Edwards, Jr., Randall T. Kerhin, and Turbit H. Slaughter Sep. 1974 107 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21848)
(E75-10314; NASA-CR-142916) Avail: NTIS HC $5.25 CSCL 08G

The authors have identified the following significant results. Field work in Baltimore County revealed that the signature returns of serpentinitic and nonserpentinitic rocks correlates with the vegetation cover and land use pattern. In Maryland Piedmont, bedrock lithology and structure are enhanced only to the extent that land use is geologically dictated. Two prominent sets of linear features are detected on ERTS-1 imagery at N 45 deg E and N 20 deg E. Beaches of Chesapeake Bay are classified as broad and narrow beaches based on the width of the backshore zone. It is shown by comparing historical shorelines of Ocean City, from the inlet to the Maryland-Delaware line that reversal zones of erosion and accretion occur at different locations for different periods. High reflectance levels (high marsh-high topographic areas) for the lower Eastern Shore are found to be distributed as two distinct trending linear ridge systems. Observations of MSS band 5 dated 9 April 1974 exhibited an

unique sedimentation pattern for Chesapeake Bay. Following a 1.5 inch rainfall, heavy concentration of suspended sediments is observed on the imagery, particularly in the area of the turbidity maximum.

N75-26459*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, May 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 16 Jun. 1975 3 p EREP
(Contract NAS9-13276)
(E75-10315; NASA-CR-142917; PR-23) Avail: NTIS HC $3.25 CSCL 08E

There are no author-identified significant results in this report.

N75-26460*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Progress Report, May 1975
Charles E. Poulton, Principal Investigator 6 Jun. 1975 3 p EREP
(Contract NAS9-13286)
(E75-10316; NASA-CR-142918; MPR-20) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-26461*# Delaware Univ., Newark. Coll. of Marine Studies.
MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH
V. Klemas, Principal Investigator, G. Davis, and H. Wang 13 Jun. 1975 2 p ERTS
(Contract NAS5-20983)
(E75-10317; NASA-CR-142919) Avail: NTIS HC $3.25 CSCL 13B

The author has identified the following significant results. An integrated satellite-aircraft-drogue approach was developed which employs remotely tracked expendable drogues together with satellite and aircraft observations of oil slicks, waste plumes, and natural tracers, such as suspended sediment. Tests conducted on the Continental Shelf and in Delaware Bay indicate that the system provides a cost effective means of monitoring current circulation and verifying oil slick and ocean waste dispersion models even under severe environmental conditions.

N75-26462*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, May 1975
Paul M. Merifield, Principal Investigator 5 Jun. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10318; NASA-CR-142920; MPR-24) Avail: NTIS CSCL 08E

The author has identified the following significant results. Thin sections of rock exposed along the San Diego River linear were prepared and determined to be fault breccia. Single band and ratio images of the western Mojave Desert were prepared from the multispectral scanner digital tapes. Subtle differences in color of soil and rock are enhanced on the ratio images. Two north-northeast trending linears (Horsethief Canyon and Pine Valley Creek) and an east-west linear (Pine Creek) were concluded to have resulted from erosion along well-developed foliation in crystalline basement rocks.

N75-26463*# Iowa Geological Survey Remote Sensing Lab.
LAND CLASSIFICATION OF SOUTH-CENTRAL IOWA FROM COMPUTER ENHANCED IMAGES Progress Report, 3 Feb. - 3 May 1975
James V. Taranik, Principal Investigator (EROS Data Center, Sioux Falls, S. D.), Frederic Billingsley (JPL), and James R. Lucas 3 May 1975 12 p ERTS
(Contract NAS5-20832)
(E75-10319; NASA-CR-142921) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-26464*# American Univ., Washington, D.C. Dept. of Biology.
ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY Final Report
Richard R. Anderson, Principal Investigator, Virginia Carter, and John McGinness 15 Jun. 1975 113 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21752)
(E75-10320; NASA-CR-142922) Avail: NTIS HC $5.25 CSCL 08H

The author has identified the following significant results. Data from aircraft can be used for large scale mapping where detailed information is necessary, whereas Landsat-1 data are useful for rapid mapping of gross wetland boundaries and vegetative composition and assessment of seasonal change plant community composition such as high and low growth forms of Spartina alterniflora, Juncus roemarianus, and Spartina cynosuroides. Spoil disposal and wetland ditching activities may also be defined. Wetland interpretation is affected by tidal stage; drainage patterns are more easily detected at periods of low water. Species discrimination is easier at periods of high water during the growing season; upper wetland boundaries in fresh water tidal marshes are more easily delineated during the winter months when marsh vegetation is largely dead or dormant. Fresh water discharges from coastal streams may be inferred from the species composition of contiguous wetlands.

N75-26465*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA
Robert H. Rogers, Principal Investigator, Larry E. Reed, and V. Elliot Smith (Cranbrook Inst. of Sci.) Mar. 1975 16 p refs Presented at the 41st Ann. Meeting of the Amer. Soc. of Photogrammetry, Washington, D. C., Mar. 1975 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10321; NASA-CR-142923; BSR-4183) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. LANDSAT was used as a basis for producing geometrically-corrected, color-coded imagery of turbidity and circulation patterns in Saginaw Bay, Michigan (Lake Huron). This imagery shows nine discrete categories of turbidity, as indicated by nine Secchi depths between 0.3 and 3.3 meters. The categorized imagery provided an economical basis for extrapolating water quality parameters from point samples to unsample areas. LANDSAT furnished a synoptic view of water mass boundaries that no amount of ground sampling or monitoring could provide.

N75-26466*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA
Robert H. Rogers, Principal Investigator, C. L. Wilson, L. E. Reed, N. J. Shah, R. Akeley, T. G. Mara (Ohio-Kentucky-Indiana Reg. Council of Govt., Cincinnati), and V. Elliot Smith (Cranbrook Inst. of Sci.) Jun. 1975 11 p refs Presented at the Symp. on Machine Processing of Remotely Sensed Data, Lafayette, Ind., Jun. 1975 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10322; NASA-CR-142924; BSR-4183) Avail: NTIS HC $3.25 CSCL 13B

The author has indentified the following significant results. LANDSAT was used as a basis for inventorying land use within each of the Ohio-Kentucky-Indiana regional commissions, 225 drainage areas, and nine counties. Computer tabulations were produced to obtain the area covered by each of 16 land

use categories within 225 drainage areas. The 16 categories were merged into ten categories and mapped at a scale of 1 inch = 5,000 ft, with detail to 0.44 hectares for the 2,700 sq mi region. These products were produced in less than 90 days, at a cost of $20,000.

N75-26467*# National Environmental Satellite Service, Suitland, Md.
AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKES STUDIES Final Report
A. E. Strong, Principal Investigator and H. G. Stumpf Dec. 1974 254 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG)
(E75-10323; NASA-CR-142925) Avail: NTIS HC $8.50 CSCL 08H

The author has identified the following significant results. Prevailing wind direction on Lake Michigan is southwesterly, although during winter northwesterly stresses are common. Along the western shore the current favors a northward direction. ERTS-1 observations indicate that the southward-flowing current along the Michigan shoreline of the thumb is only reversed by southerly resultant wind stress. Along the Canadian shoreline, a northward current was observed north of Kettle Point. ERTS-1 data also reveal that a preferred southward-flowing current is found along the Detroit shoreline of Lake St. Clair. Eastward flow of surface water from the shallow western basin of Lake Erie into the middle basin is most obvious during northwesterly and northerly wind stresses. The reverse wind direction especially east and southeasterly, appear to hold the effluents from the Detroit and Maumee Rivers in the western basin. Across-lake winds from the north and south induce eddy-like circulation in surface waters of Lake Ontario. Counterclockwise alongshore flow persists in the western basin under most wind conditions.

N75-26468*# Wyoming Univ., Laramie. Dept. of Geology.
ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES Final Report, Jul. 1972 - Dec. 1974
Robert S. Houston, Principal Investigator, Ronald W. Marrs, Leon E. Borgman, S. S. Agard, R. Barton, D. L. Blackstone, R. M. Breckenridge, E. R. Decker, J. Earle, and M. A. Evans Jan. 1975 303 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E75-10324; NASA-CR-142926) Avail: NTIS HC $9.25 CSCL 08F

The author has identified the following significant results. The Earth Resources Technology Satellite data included the following successful applications: (1) general geologic mapping, (2) structural and tectonic studies, (3) landforms and surface processes, (4) mineral exploration, (5) land use inventories, (6) hydrologic studies, (7) investigations in agriculture and forestry, and (8) environmental quality and ecology. The chief advantages of ERTS-1 data for geologic studies are synoptic view, spectral information, and seasonal coverage. The spectral data and repetitive aspect are also important for land use and vegetation studies. Low resolution and lack of steoscopic coverage were found to be the main limitations of ERTS data.

N75-26469*# Norwegian Water Resources and Electricity Board, Oslo.
EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS Final Report
Gunnar Oestrem, Principal Investigator 1974 11 p refs Sponsored by NASA ERTS
(E75-10325; NASA-CR-142927) Avail: NTIS HC $3.25 CSCL 08L

The author has identified the following significant results. The transient snowline on five outlet glaciers from the Jostedalsbreen ice cap in southwestern Norway could be determined from ERTS image no. 1336-102060, when bands MSS 5, 6, and 7 were combined in an additive color viewer. The snowline was situated at a very low altitude at the time of imagery (24 June 1973) indicating that glacier melt was behind normal schedule, a fact that has a hydrologic bearing: less melt water in the streams could be expected. The use of ERTS imagery in snowline determinations proved realistic and relatively easy to apply in practice.

N75-26470*# TRW Systems Group, Redondo Beach, Calif.
TRADE-OFF ANALYSIS OF MODES OF DATA HANDLING FOR EARTH RESOURCES (ERS), VOLUME 1 Final Report
28 Mar. 1975 266 p refs
(Contract NAS5-21927)
(NASA-CR-143804; TRW-22591-6001-RU-00-Vol-1) Avail: NTIS HC $8.50 CSCL 05B

Data handling requirements are reviewed for earth observation missions along with likely technology advances. Parametric techniques for synthesizing potential systems are developed. Major tasks include: (1) review of the sensors under development and extensions of or improvements in these sensors; (2) development of mission models for missions spanning land, ocean, and atmosphere observations; (3) summary of data handling requirements including the frequency of coverage, timeliness of dissemination, and geographic relationships between points of collection and points of dissemination; (4) review of data routing to establish ways of getting data from the collection point to the user; (5) on-board data processing; (6) communications link; and (7) ground data processing. A detailed synthesis of three specific missions is included. Author

N75-26471*# TRW Systems Group, Redondo Beach, Calif.
TRADE-OFF ANALYSIS OF MODES OF DATA HANDLING FOR EARTH RESOURCES (ERS), VOLUME 2 Final Report
28 Mar. 1975 286 p refs
(Contract NAS5-21927)
(NASA-CR-143806; TRW-22591-6001-RU-00-Vol-2) Avail: NTIS HC $8.75 CSCL 05B
For abstract, see N75-26470.

N75-26472*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: US STANDARD CATALOG NO. U-33
31 May 1975 147 p
(NASA-TM-X-66871) Avail: NTIS CSCL 05B

A catalog covering LANDSAT imagery for May 1975 is presented. The catalog identifies imagery which was processed and input to the data file during the referenced month. Imagery data cover the continental United States, Alaska, and Hawaii. Coverage maps and observational data obtained by LANDSAT 1 and LANDSAT 2 are given. E.H.W.

N75-26473*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ESTIMATING PROPORTIONS OF OBJECTS FROM MULTISPECTRAL SCANNER DATA Final Technical Report, 15 May 1974 - 14 Mar. 1975
H. M. Horwitz, J. T. Lewis, and A. P. Pentland May 1975 117 p refs
(Contract NAS9-14123)
(NASA-CR-141862; ERIM-109600-13-F) Avail: NTIS HC $5.25 CSCL 05B

Progress is reported in developing and testing methods of estimating, from multispectral scanner data, proportions of target classes in a scene when there are a significiant number of boundary pixels. Procedures were developed to exploit: (1) prior information concerning the number of object classes normally occurring in a pixel, and (2) spectral information extracted from signals of adjoining pixels. Two algorithms, LIMMIX and nine-point mixtures, are described along with supporting processing techniques. An important by-product of the procedures, in contrast to the previous method, is that they are often appropriate when the number of spectral bands is small. Preliminary tests on LANDSAT data sets, where target classes were (1) lakes and ponds, and (2) agricultural crops were encouraging. Author

N75-26474*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ATMOSPHERIC EFFECTS IN MULTISPECTRAL REMOTE SENSOR DATA Final Technical Report, 15 May 1974 - 14 Mar. 1975
Robert E. Turner May 1975 120 p refs

(Contract NAS9-14123)
(NASA-CR-141863; ERIM-109600-15-F) Avail: NTIS HC $5.25 CSCL 04A

The problem of radiometric variations in multispectral remote sensing data which occur as a result of a change in geometric and environmental factors is studied. The case of spatially varying atmospheres is considered and the effect of atmospheric scattering is analyzed for realistic conditions. Emphasis is placed upon a simulation of LANDSAT spectral data for agricultural investigations over the United States. The effect of the target-background interaction is thoroughly analyzed in terms of various atmospheric states, geometric parameters, and target-background materials. Results clearly demonstrate that variable atmospheres can alter the classification accuracy and that the presence of various backgrounds can change the effective target radiance by a significant amount. A failure to include these effects in multispectral data analysis will result in a decrease in the classification accuracy. Author

N75-26475*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
METHODS OF EXTENDING SIGNATURES AND TRAINING WITHOUT GROUND INFORMATION Final and Technical Report, 15 May 1974 - 14 Mar. 1975
R. G. Henderson,, G. S. Thomas, and R. F. Nalepka May 1975 91 p refs
(Contract NAS9-14123)
(NASA-CR-141864; ERIM-109600-16-F) Avail: NTIS HC $4.75 CSCL 05B

Methods of performing signature extension, using LANDSAT-1 data, are explored. The emphasis is on improving the performance and cost-effectiveness of large area wheat surveys. Two methods were developed: ASC, and MASC. Two methods, Ratio, and RADIFF, previously used with aircraft data were adapted to and tested on LANDSAT-1 data. An investigation into the sources and nature of between scene data variations was included. Initial investigations into the selection of training fields without in situ ground truth were undertaken. Author

N75-26476*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
YIELD PREDICTION BY ANALYSIS OF MULTISPECTRAL SCANNER DATA Final Report, 15 May 1974 - 14 Mar. 1975
John E. Colwell and Gwynn H. Suits May 1975 82 p refs
(Contract NAS9-14123)
(NASA-CR-141865; ERIM-109600-17-F) Avail: NTIS HC $4.75 CSCL 02C

A preliminary model describing the growth and grain yield of wheat was developed. The modeled growth characteristics of the wheat crop were used to compute wheat canopy reflectance using a model of vegetation canopy reflectance. The modeled reflectance characteristics were compared with the corresponding growth characteristics and grain yield in order to infer their relationships. It appears that periodic wheat canopy reflectance characteristics potentially derivable from earth satellites will be useful in forecasting wheat grain yield. Author

N75-26477*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTRODUCTION TO QUANTITATIVE REMOTE SENSING
John Lindenlaub and James Russell 1974 63 p
(Contract NAS9-14016)
(NASA-CR-141860; LARS-Note-110474) Avail: NTIS HC $4.25 CSCL 20A

The quantitative approach to remote sensing is discussed along with the analysis of remote sensing data. Emphasis is placed on the application of pattern recognition in numerically oriented remote sensing systems. A common background and orientation for users of the LARS computer software system is provided. Author

N75-26478*# Kansas Univ. Center for Research, Inc., Lawrence.
ROUGH SURFACE SCATTERING BASED ON FACET MODEL
H. R. Khamsi, A. K. Fung, and F. T. Ulaby Nov. 1974 158 p refs
(Contract NAS9-10261)
(NASA-CR-141869; RSL-TR-177-52) Avail: NTIS HC $6.25 CSCL 20F

A model for the radar return from bare ground was developed to calculate the radar cross section of bare ground and the effect of the frequency averaging on the reduction of the variance of the return. It is shown that, by assuming that the distribution of the slope to be Gaussian and that the distribution of the length of the facet to be in the form of the positive side of a Gaussian distribution, the results are in good agreement with experimental data collected by an 8- to 18-GHz radar spectrometer system. It is also shown that information on the exact correlation length of the small structure on the ground is not necessary; an effective correlation length may be calculated based on the facet model and the wavelength of the incident wave. Author

N75-26479*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ADAPTIVE PROCESSING FOR LANDSAT DATA Final Report, 15 May 1974 - 14 Mar. 1975
Robert B. Crane and James F. Reyer May 1975 66 p refs
(Contract NAS9-14123)
(NASA-CR-141894; ERIM-109600-14-F) Avail: NTIS CSCL 05B

Analytical and test results on the use of adaptive processing on LANDSAT data are presented. The Kalman filter was used as a framework to contain different adapting techniques. When LANDSAT MSS data were used all of the modifications made to the Kalman filter performed the functions for which they were designed. It was found that adaptive processing could provide compensation for incorrect signature means, within limits. However, if the data were such that poor classification accuracy would be obtained when the correct means were used, then adaptive processing would not improve the accuracy and might well lower it even further. Author

N75-26480*# Texas A&M Univ., College Station. Dept. of Mathematics.
OPTIMAL SELECTION OF PASSES
L. F. Guseman, Jr. and Bruce P. Marion Jan. 1975 19 p ref
(Contract NAS9-13894)
(NASA-CR-141877) Avail: NTIS HC $3.25 CSCL 05B

Preliminary numerical results obtained from the application of a linear feature selection technique to the determination of combinations of passes which best discriminate between a given set of crops in a given area of interest, are reported. The results obtained are not purported to hold in a general situation, but only for the given set of crops and the given, but unknown, levels of several factors-such as soil type, and fertilizer practice, holding in the area of interest. However, by identifying the various factors affecting the spectral signatures, and by formulating a regression model one could use the feature selection technique to determine the regression coefficients for predicting optimal passes for a given set of crops. Another use of the feature selection technique as applied to multiple pass registered data is the generation of enhanced grey scale displays by using a single linear combination of all channels of all designated passes as opposed to a single channel within a single pass. Author

N75-26481*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AVIATION'S ROLE IN EARTH RESOURCES SURVEYS
C. A. Syvertson and Donald R. Mulholland Aug. 1972 33 p refs
(NASA-TM-X-62436; A-6081) Avail: NTIS HC $3.75 CSCL 08G

The role of satellites designed to make a wide variety of earth observations is discussed along with the renewed interest in the use of aircraft as platforms for similar and complementary earth resources surveys. Surveys covering the areas of forestry, agriculture, hydrology, oceanography, geology, and geography are inculude. Aerials surveys equipped for nonphotographic remote sensing and aircraft flights synchronized with satellite observations to provide correlated data are discussed. Photographs are shown to illustrate preliminary results from several of the test sites. Author

N75-26482*# Colorado School of Mines, Golden. Dept. of Geology.
APPLICATION OF REMOTE SENSOR DATA TO GEOLOGIC ANALYSIS OF THE BONANZA TEST SITE COLORADO Semiannual Progress Report, 1 Oct. 1974 - 31 Mar. 1975
Keenan Lee, comp. Apr. 1975 20 p refs
(Grant NGL-06-001-015)
(NASA-CR-143082; RSR-75-2) Avail: NTIS HC $3.25 CSCL 08G

Selected samples of anomalous surface features commonly associated with the various types of uranium deposits are presented and recommendations for sensor applications are given. The features studied include: epigenetic uranium ore roll type; precambrian basal conglomerate type; vein-type uranium deposits; pipe-structure or diatreme deposits; evaporitic uranium deposits. The hydrogeology of the Mosquito Range and the San Luis Valley is also examined. Author

N75-26483# Bureau of Mines, Laramie, Wyo. Energy Research Center.
PROPERTIES OF UTAH TAR SANDS: SOUTH SEEP RIDGE AREA, P. R. SPRING DEPOSIT
L. A. Johnson, L. C. Marchant, and C. Q. Cupps Dec. 1974 19 p refs
(PB-240153/7; BM-RI-8003) Avail: NTIS HC $3.25 CSCL 08G

Results of analyses of three cores from the south Seep Ridge area of the P.R. Spring tar sand deposit of northeastern Utah are given. Four tar sand zones are indicated in the south Seep Ridge area. The zones vary in average thickness from 13 to 24 feet. The total net thickness of the tar sand in the three coreholes ranges from 71 to 112 feet. The tar sand occurs between the depths of 27 and 254 feet. It has good porosity, 25.6 pct of bulk volume, high permeability before and after oil extraction, 819 and 2,218 md respectively, but a relatively low oil saturation, 36.5 pct of pore volume. Gravity of the oil ranges from 8.2 degrees to 16.5 degrees API. GRA

N75-26484# Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
ALTANTIC OUTER CONTINENTAL SHELF ENERGY RESOURCES: AN ECONOMIC ANALYSIS
Robert J. Kalter, Wallace E. Tyner, and Thomas H. Stevens Nov. 1974 95 p refs
(Grant NOAA-15-8118B)
(COM-75-10330/9; AE-Res-74-17; NOAA-75021104) Avail: NTIS HC $4.75 CSCL 08G

The Atlantic Outer Continental Shelf (AOCS) acreage available for future leasing is considered. The geology and petroleum potential of the AOCS region is examined and alternative scenarios are developed with respect to the quantity and location of possible hydrocarbon resources. The potential costs of energy exploration, discovery, and production in various regions of the AOCS are described and forecast. Current leasing policy and resource management procedures are discussed and alternative leasing and management policy issues with respect to the AOCS are delineated. An analytical framework is formulated and used to analyze impacts forthcoming from the adoption of such alternative policies. GRA

N75-26485# Stanford Univ., Calif.
STIMULATION AND RESERVOIR ENGINEERING OF GEOTHERMAL RESOURCES Progress Report
Paul Kruger Jun. 1974 149 p refs
(Grant NSF GI-34925)
(PB-239718/0; SU-SGT-TR-1; NSF/RA/N-74-132; PR-3) Avail: NTIS HC $5.75 CSCL 08H

Experimental and computational data are developed to evaluate the optimum performance of fracture stimulated geothermal reservoirs along with a geothermal reservoir model to evaluate important thermophysical, hydrodynamic, and chemical parameters based on fluid-energy-volume balances as part of standard reservoir engineering practice. A laboratory model is constructed of an explosion produced chimney to obtain experimental data on the processes of in-place boiling, moving flash fronts, and two phase flow in porous and fracture hydrothermal reservoirs. GRA

N75-26488# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT
Feb. 1975 362 p refs Sponsored in part by the Dept. of the Interior and NSF
(PB-239579/6; ISBN-0-309-02343-2) Avail: NTIS MF $2.25; HC $6.00 available from National Academy of Sciences, Washington, D. C. 20418 CSCL 08G

This report studies the general issues involved with the continued availability and efficient use of our minerals and mineral resources: demand, supply, technology, and environmental impact of production. Among the topics discussed are technological opportunities in the materials cycle to offset shortages; a conservation ethic with regard to our resources; capital, manpower, and time constraints on technology; world resources of petroleum and natural gas, discovered reserves and undiscovered recoverable resources; production of copper; environmental effects of coal production and use; mine safety and health; effects of sulfur pollutants on the public health; evaluation of demand projections; methods for estimating minerals resources and reserves. GRA

N75-26487# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 1: REPORT OF PANEL ON MATERIALS CONSERVATION THROUGH TECHNOLOGY
Feb. 1975 580 p refs Conf. held 10-11 Apr. 1974 Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239580/4) Avail: NTIS HC $13.25 CSCL 08G

Under six general headings - Background, Technology for Materials Cycle, Critical Materials for Energy Technology, Materials Conservation in User Industries, and Institutional Aspects of Materials Conservation - these twenty-two papers constitute the extensive information base used in preparing the section on Materials Conservation Through Technology of the report 'Mineral Resources and the Environment'. Portions of this document are not fully legible. GRA

N75-26488# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 2: REPORT OF PANEL ON ESTIMATION OF MINERAL RESERVES AND RESOURCES
W. W. Mallory and M. King Hubbert Feb. 1975 27 p refs Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239581/2) Avail: NTIS HC $3.75 CSCL 08G

As background material to the estimates of oil and natural gas reserves and resources presented in the report 'Mineral Resources and the Environment', three brief U.S.G.S. communications are reproduced for those who wish to go further into the detail of the estimated figures. These are: U.S.G.S. releases revised, U.S. oil and gas resource estimates; Synopsis of Procedure: Accelerated National Oil and Gas Resource Evaluation; (ANOGRE), W. W. Mallory, USGS, January 1974 and, Ratio Between Recoverable Oil Per Unit Volume of Sediments for Future Exploratory Drilling to that of the Past for the Conterminous United States. GRA

N75-26489# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 3: REPORT OF PANEL ON THE IMPLICATIONS OF MINERAL PRODUCTION FOR HEALTH AND THE ENVIRONMENT
W. K. C. Morgan, Daniel B. Botkin, Thomas D. Brock, Lester B. Lave, and Joseph Costello Feb. 1975 122 p refs Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239582/0) Avail: NTIS HC $5.25 CSCL 08G

Selected background material contributed to the section on the environmental implications of coal extraction and use in the report 'Mineral Resources and the Environment' is given. Topics covered are: SO2 emissions in the context of the global sulfur cycle, short-term health considerations regarding the choice of

coal as a fuel, the economic impact of coalworkers' pneumoconiosis, and natural ecosystems and the industrial production of carbon dioxide. GRA

N75-26490# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 4: REPORT OF PANEL ON DEMAND FOR FUEL AND MINERAL RESOURCES
Feb. 1975 95 p refs Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239583/8) Avail: NTIS HC $4.75 CSCL 08G

This bibliographic review provides an overview of the methodologies recently used to forecast demand for minerals and commodities. The selected forecasts described and analyzed are primarily for fossil fuels, with some included for nickel, copper and sand and gravel. The review provides a data base for the discussion of demand forecasting that appears in the fourth section of the report 'Mineral Resources and the Environment'. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-26491 British Library Lending Div., Boston Spa (England).
USING SYSTEMS METHODS FOR ANALYSING INTEGRATED ENERGY SUPPLY, SUMMARY
A. Voss 18 Feb. 1975 3 p Transl. into ENGLISH from proceedings of VDI-DK Conf. on Integrated Energy Supply (Hamburg), 7-9 May 1974
(BLL-CE-Trans-6473-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of cybernetics to solve technological problems involving energy supply, environment pollution, industrial and urban planning are briefly summarized. J.R.T.

N75-26492 British Library Lending Div., Boston Spa (England).
UTILISATION OF WASTE HEAT FROM INDUCTIVE MELTING INSTALLATIONS
H. J. Schwindt 7 Oct. 1974 12 p Transl. into ENGLISH from Elektrowaerme Intern. (West Germany), v. 32, no. B2, Apr. 1974 p 78-82
(BLL-OA-Trans-949-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Principles and technical solutions are given for the utilization of waste heat from industrial inductive melting installations. Examples of existing systems and their design are presented. Among the possible applications discussed are space heating, hot water preparation and the heating of swimming pools. D.M.L.

N75-26493 Pennsylvania State Univ., University Park.
FUEL USE IN THE US ELECTRICAL UTILITY INDUSTRY, 1971 - 1990 Ph.D. Thesis
W. Noel Gillatt 1974 183 p
Avail: Univ. Microfilms Order No. 75-10810

Factors influencing the supply of and demand for electricity are discussed in terms of the decisions facing an individual electrical utility. A quantitative model is developed and utilized to simulate the decisions taken by an electrical utility to use primary fuels over time. Emphasis is given to environmental legislation and how it affects the different primary fuels in the electrical utility market. The model is premised on the assumption that the basic objective of the regulated utility is to minimize the present value of foreseeable costs while servicing the anticipated electrical load demanded. By varying the parameters representing fuel prices, technological factors, and public policy regression analysis is used to obtain response functions giving fuel use for the horizon years as a function of these parameters. Specific cases examined include coal-oil intercompetition for the year 1980 and coal-nuclear position in the 1990 electrical utility market. Dissert. Abstr.

N75-26494*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIATED MICROWAVE POWER TRANSMISSION SYSTEM EFFICIENCY MEASUREMENTS
R. M. Dickinson and W. C. Brown (Raytheon Co., Waltham, Mass.) 15 May 1975 45 p refs
(Contract NAS7-100)
(NASA-CR-142986; JPL-TM-33-727) Avail: NTIS HC $3.75 CSCL 10A

The measured and calculated results from determining the operating efficiencies of a laboratory version of a system for transporting electric power from one point to another via a wireless free space radiated microwave beam are reported. The system's overall end-to-end efficiency as well as intermediated conversion efficiencies were measured. The maximum achieved end-to-end dc-to-ac system efficiency was 54.18% with a probable error of + or - 0.94%. The dc-to-RF conversion efficiency was measured to be 68.87% + or - 1.0% and the RF-to-dc conversion efficiency was 78.67 + or - 1.1%. Under these conditions a dc power of 495.62 + or - 3.57 W was received with a free space transmitter antenna receiver antenna separation of 170.2 cm (67 in). Author

N75-26495*# Honeywell, Inc., Minneapolis, Minn.
DEVELOPMENT OF FLAT-PLATE SOLAR COLLECTORS FOR THE HEATING AND COOLING OF BUILDINGS Final Report
J. W. Ramsey, J. T. Borzoni, and T. H. Holland Jun. 1975 209 p refs
(Contract NAS3-17862)
(NASA-CR-134804; HONEYWELL-2852-40057) Avail: NTIS HC $7.25 CSCL 10A

The relevant design parameters in the fabrication of a solar collector for heating liquids were examined. The objective was to design, fabricate, and test a low-cost, flat-plate solar collector with high collection efficiency, high durability, and requiring little maintenance. Computer-aided math models of the heat transfer processes in the collector assisted in the design. The preferred physical design parameters were determined from a heat transfer standpoint and the absorber panel configuration, the surface treatment of the absorber panel, the type and thickness of insulation, and the number, spacing and material of the covers were defined. Variations of this configuration were identified, prototypes built, and performance tests performed using a solar simulator. Simulated operation of the baseline collector configuration was combined with insolation data for a number of locations and compared with a predicted load to determine the degree of solar utilization. Author

N75-26496*# Pratt and Whitney Aircraft, South Windsor, Conn.
DEVELOPMENT OF ADVANCED FUEL CELL SYSTEM, PHASE 3 Final Report
L. M. Handley, A. P. Meyer, and W. F. Bell 30 Jan. 1975 131 p refs
(Contract NAS3-15339)
(NASA-CR-134818; PWA-5201) Avail: NTIS HC $5.75 CSCL 10A

A multiple task research and development program was performed to improve the weight, life, and performance characteristics of hydrogen-oxygen alkaline fuel cells for advanced power systems. Gradual wetting of the anode structure and subsequent long-term performance loss was determined to be caused by deposition of a silicon-containing material on the anode. This deposit was attributed to degradation of the asbestos matrix, and attention was therefore placed on development of a substitute matrix of potassium titanate. An 80 percent gold 20 percent platinum catalyst cathode was developed which has the same performance and stability as the standard 90 percent gold - 10 percent platinum cathode but at half the loading. A hybrid polysulfone/epoxy-glass fiber frame was developed which combines the resistance to the cell environment of pure polysulfone with the fabricating ease of epoxy-glass fiber laminate.

These cell components were evaluated in various configurations of full-size cells. The ways in which the baseline engineering model system would be modified to accommodate the requirements of the space tug application are identified. Author

N75-26497*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF NASA LEWIS RESEARCH CENTER SOLAR HEATING AND COOLING AND WIND ENERGY PROGRAMS
Richard W. Vernon 1975 23 p refs Presented at the Southeastern Conf. on Appl. of Solar Energy, Huntsville, Ala., 24-26 Mar. 1975; sponsored by Ala. Univ.
(NASA-TM-X-71745; E-8383) Avail: NTIS HC $3.25 CSCL 10A

Plans for the construction and operation of a solar heating and cooling system in conjunction with an office building being constructed at Langley Research Center, are discussed. Supporting research and technology includes: testing of solar collectors with a solar simulator, outdoor testing of collectors, property measurements of selective and nonselective coatings for solar collectors, and a solar model-systems test loop. The areas of a wind energy program that are being conducted include: design and operation of a 100-kW experimental wind generator, industry-designed and user-operated wind generators in the range of 50 to 3000 kW, and supporting research and technology for large wind energy systems. An overview of these activities is provided. Author

N75-26498# Aerospace Corp., El Segundo, Calif.
SOLAR CELL AND ARRAY STANDARDIZATION FOR AIR FORCE SPACECRAFT
H. J. Killian, E. Wade, J. F. Wise, and H. T. Sampson 24 Jul. 1974 9 p refs
(Contract F04701-74-C-0075)
(AD-A004544; TR-0075(5901-02)-2; SAMSO-TR-74-273) Avail: NTIS CSCL 22/2

Efforts have been in progress to evaluate and to accomplish solar cell and array standardization for Air Force spacecraft. Analysis results indicate that the array area and weight penalties that typically would be involved in the use of a standard solar cell module would be less than 10%. The potential payoff of standardization is cost savings to the Air Force and improved solar array reliability. Cost experience data from NASA are used to show that large savings over a 12-year period might be possible. An attempt is being made to standardize procurement practices at the power system and solar array levels and to standardize hardware at the solar cell level. Three documents have been prepared as part of this effort: a military standard for the design of space vehicles dc power systems (MIL-STD-1539), a military specification for solar arrays (MIL-S-XXXXX), and a military specification for solar cells (MIL-C-83443). GRA

N75-26499# Army War Coll., Carlisle Barracks, Pa.
MATERIALS AND THE NEW DIMENSIONS OF CONFLICT, REVISED VERSION
Alwyn H. King and John R. Cameron 15 Dec. 1974 30 p refs Revised
(AD-A004263; MIRM-74-10-Rev) Avail: NTIS CSCL 05/4

The implications of domestic shortages of critical materials, in terms of possible U.S. vulnerability to future military, political, or economic coercion, are discussed. Political and economic developments in a supplier nation which can create the environment for economic coercion are outlined, as are measures which the United States and other user nations can undertake to prevent or mitigate such coercion, i.e., development of domestic resources, development of substitute materials, encouragement of user-supplier interdependency, and maintenance of an adequate stockpile of critical materials. GRA

N75-26500*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POTENTIAL STRUCTURAL MATERIAL PROBLEMS IN A HYDROGEN ENERGY SYSTEM
Hugh R. Gray, Howard G. Nelson, Robert E. Johnson, Bryan McPherson, Frank S. Howard, and James H. Swisher (Sandia Labs., Livermore, Calif.) Jun. 1975 29 p refs
(NASA-TM-X-71752; E-8380) Avail: NTIS HC $3.75 CSCL 10A

Potential structural material problems that may be encountered in the three components of a hydrogen energy system - production, transmission/storage, and utilization - were identified. Hydrogen embrittlement, corrosion, oxidation, and erosion may occur during the production of hydrogen. Hydrogen embrittlement is of major concern during both transmission and utilization of hydrogen. Specific materials research and development programs necessary to support a hydrogen energy system are described. Author

N75-26501# Mitre Corp., Bedford, Mass.
RESIDENTIAL ENERGY CONSUMPTION AND SMALL SCALE OPTIONS OF ENERGY SYSTEMS FOR SPACE HEATING Interim Report
D. C. Chan Nov. 1974 64 p refs
(Grant NSF CG-00007)
(PB-239941/8; MTR-2951) Avail: NTIS HC $4.25 CSCL 13A

The recent oil crisis has drawn attention to New England's extreme dependence upon oil as a source of energy and, in particular, for space heating. In this study some alternatives to conventional fossile fueled space heating systems are evaluated in terms of total annual costs to the consumer and fuel demand. It is concluded that a solar collector system back-up by conventionally fueled systems will be economically competitive if mass production is successful in reducing the manufacturing costs of solar panels. GRA

N75-26502# Avco-Everett Research Lab., Everett, Mass.
MHD POWER GENERATION (VIKING SERIES) WITH HYDROCARBON FUELS, PART 3 Final Report, Apr. 1971 - Oct. 1974
R. Kessler, O. K. Sonjou, J. Teno, L. Lontai, and D. Meader Nov. 1974 282 p refs
(Contract F33615-71-C-1456; AF Proj. 3145)
(AD-A004216; AFAPL-TR-74-47-Pt-3) Avail: NTIS CSCL 10/2

A two-part program is described, which had as its objective the development of compact high performance MHD generators to meet the need for burst-power portable power supplies for a variety of military and industrial applications. The first part of the program, referred to as VIKING I, was an experimental program performed using a high performance MHD generator operating on toluene and oxygen for bursts of about two seconds duration. This generator produced a maximum power of 1.42 MW, and a maximum specific power output (electrical output per unit mass flow) of 0.62 MW/kg/sec. The second part of the program was the design of a compact MHD generator (VIKING II), of 10 MW power output and 2000 kg dry weight. The design was carried to the point of having completed the basic designs and fabrication plans of all major components and subsystems, and their interfaces. GRA

N75-26503# Bureau of Mines, Washington, D.C.
SULFER IN COALS
A. Z. Yurovskii 1974 463 p refs Transl. into ENGLISH from Akad. Nauk. SSSR, Inst. Gorynchikh Iskopaemykh Tr. (USSR), 1960
(Contract NSF C-466)
(TT-70-57216) Avail: NTIS HC $11.50 CSCL 21D

Various aspects of the origin of coal sulfur, interrelationships of sulfur compounds of different types, and topochemical transformations of pyrite (one of the main constituents of sulfur compounds in coal) were investigated. The theoretical principles underlying the separation of coal-pyrite complexes are discussed along with technological processes of coal cleaning. M.J.S.

N75-26504# National Center for Energy Management and Power, Philadelphia, Pa.
RESEARCH ON SOLAR CELL ARRAYS AND ELECTRIC ENERGY Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
J. C. Denton Jul. 1974 38 p
(Grant NSF GI-29729)
(PB-239338/7; NSF/RANN/SE/GI-29729/PR-74-2; NSF/RA/N-74-152) Avail: NTIS HC $3.75 CSCL 13A

Four research projects are briefly described: (1) low cost processes for integrated solar arrays; (2) attitudes of financial

institutions toward the use of solar heating; (3) integrated solar powered space climate conditioning systems; and (4) electric energy allocation. Budgetary information is included for all the projects. GRA

N75-26505# General Electric Co., Philadelphia, Pa. Space Div.
SOLAR HEATING EXPERIMENT ON THE GROVER CLEVELAND SCHOOL, BOSTON, MASSACHUSETTS
John E. Notestein and Calvin D. Fowler 15 Jul. 1974 206 p (Contract NSF C-869)
(PB-239516/8; NSF/RA/N-74-064) Avail: NTIS HC $7.25 CSCL 13A

The site selection, design construction, and initial operating period are described of a solar heating system installed on a metropolitan Boston school. The solar array is 4600 square feet with a peak energy output in excess of 1 million BTU/Hr and heats approximately 21,000 square feet (1/3) of the school. The system went from the concept stage to first operation in 41 days and was the first large scale heating system operating in this country. Performance data and operating experiences through May 15, 1974 along with overall conclusions are reported. GRA

N75-26506# Aerospace Corp., El Segundo, Calif. Lab. Operations.
CHRONOPOTENTIOMETRIC MEASUREMENTS OF ZINC ELECTRODEPOSITION KINETICS FROM CONCENTRATED KOH SOLUTIONS Interim Report
Stanley W. Mayer and David Taylor 17 Dec. 1974 18 p refs
(Contract F04701-74-C-0075)
(AD-A004071; TR-0075(5270-10)-2; SAMSO-TR-74-269) Avail: NTIS CSCL 07/4

In order to improve the efficiency of zinc-silver oxide cells, it consequently is desirable to examine the kinetics of zinc electrodeposition from the KOH electrolyte used in spacecraft cells. It was thought that chronopotentiometry would have the greatest probability of successful application to the caustic 41% KOH electrolyte containing 1 M ZnO solute, which is used in zinc-silver oxide cells. Chronopotentiometry was accordingly applied to compare the kinetics of zinc electrodeposition on zinc and amalgamated zinc electrodes (which are used in zinc-silver oxide storage batteries) with the kinetics for electrodeposition on nickel, lead, copper, tin, silver, gold, mercury-film, and platinum electrodes. The chronopotentiometric technique was also applied to investigate the effect of lead ion additives on zinc electrodeposition and to examine wetting agent effects on zinc electrodeposition. GRA

N75-26507# TRW Systems Group, Redondo Beach, Calif.
STUDY ON ELECTROFLUID DYNAMIC POWER GENERATION Interim Report, 23 Apr. 1973 - 22 Apr. 1974
M. N. Huberman, H. Shelton, W. Krieve, and J. Ohrenberger Oct. 1974 147 p refs
(Contract F33615-73-C-4085; AF Proj. 7116)
(AD-A004762; ARL-74-0119) Avail: NTIS CSCL 10/2

This report describes the work that has been performed during the first year of a three year Study on Electrofluid Dynamic Power Generation Program. The major goal is to improve the measured performance capabilities of EFD energy conversion devices to the point where their feasibility for specific Air Force missions has been demonstrated and their overall system design implications can be factored into quantitative assessments of total EFD generating systems. GRA

N75-26508# ESB, Inc., Yardley, Pa. ESB Technology Center.
ADVANCED HIGH CAPACITY BATTERY FOR AIRCREW SURVIVAL TRANSCEIVERS Final Report, 10 Apr. 1972 - 28 Feb. 1974
J. B. Doe, F. W. Dampier, K. Jeffries, P. E. Krouse, and N. Margalit Dec. 1974 197 p refs
(Contract F33615-72-C-1470; AF Proj. 3145)
(AD-A004543; AFAPL-TR-74-63) Avail: NTIS CSCL 10/3

A number of lithium-organic electrolyte electrochemical systems have been tested for feasibility in meeting requirements for aircrew survival communications equipment. These include: Li/LiAsF6 in tetrahydrofuran (THF)/Ag3PO4, Li/LiAsF6 in methylformate (MF)/Ag2CrO4, Li/LiAsF6 in gamma-butyrolactone (BL)/CFx, Li/LiAsF6 in 95% MF, 5% BL/CFx, Li/LiAsF6 in 95% MF, 5% PC/CFx (PC = propylene carbonate). Above systems were subjected to either a 165F or a 140F one week stand test and low temperature discharge tests at -20F and 40F. Discharge regime was 170 ma. for 30 minutes, followed by 50 ma. for 30 minutes to 1.80 v. cutoff. Only systems capable of withstanding above stand conditions and meeting contract goal of 8 Whr/cu in at room temperature are: (1) Li/2.0 molar LiAsF6 in 95% MF, 5% PC/CFx (2) Li/2.0 molar LiAsF6 in MF/CFx System (1) appears to be the more capable of the two. GRA

N75-26509# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
HYDROGEN-FUTURE FUEL-A BIBLIOGRAPHY (WITH EMPHASIS ON CRYOGENIC TECHNOLOGY)
N. A. Olien and S. A. Schiffmacher Feb. 1975 134 p refs
(COM-75-10289/7; NBS-TN-664; LC-75-600002) Avail: NTIS; SOD HC as C13.46:664 CSCL 21D

This NBS Technical Note is a compilation of references dealing directly and indirectly with the possible future use of hydrogen as a fuel. The references were selected using an automated information system operated by the Cryogenic Data Center. This bibliography of references emphasizes the use of cryogenic technology in the hydrogen field. Articles are indexed under 40 subject headings and an author index is included. Over 1600 references are included in this bibliography. GRA

N75-26510# Westinghouse Electric Corp., Baltimore, Md.
SOLAR HEATING AND COOLING EXPERIMENT FOR A SCHOOL IN ATLANTA Design Report, Jun. - Sep. 1974
Dec. 1974 268 p refs Prepared in cooperation with Georgia Inst. of Technol., Atlanta
(Contract NSF C-906)
(PB-240611/4; NSF/RA/N-74-122) Avail: NTIS HC $8.50 CSCL 13A

The first large scale integrated system providing heating and cooling for a building utilizing solar energy was designed for the George A Towns Elementary School in Atlanta, Georgia. Solar cooling is provided through the use of a hot water fired lithium bromide absorption chiller to satisfy building cooling loads. Hot water for heating and cooling is provided by a 10,000 sq. ft. solar collector array using reflective surfaces to obtain some concentration during summer months. Approximately 60% of the heating and cooling loads are expected to be met by solar energy, the balance by natural gas. The report contains details of design and principles of operation. GRA

N75-26511# National Center for Energy Management and Power, Philadelphia, Pa.
INVESTMENT POSSIBILITY OF FINANCIAL INSTITUTIONS IN SOLAR HEATING
Paul D. Twombly Jun. 1974 81 p refs
(Grant NSF GI-29729)
(PB-239756/0; NCEMP-25; NSF/RA/N-74-152(1)) Avail: NTIS HC $4.75 CSCL 13A

The influence that financial institutions may have in promoting the implementation of solar heating in commercial and residential buildings was investigated. Emphasis was placed on determining what additional financial commitments would be made by these institutions to owners and operators of buildings using solar heating. The inducements that governments could make for the financial institutions to increase these commitments were also considered. GRA

N75-26512# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
DESIGN AND TEST REPORT FOR TRANSPORTABLE SOLAR LABORATORY PROGRAM
Oct. 1974 164 p
(Grant NSF PTP-74-01555)
(PB-240609/8; HONEYWELL-41433; NSF/RA/N-74-118) Avail: NTIS HC $6.25 CSCL 13A

A portable solar heating and cooling laboratory that provides a means to test the baseline design for a solar heating and cooling system under a variety of climates is described. A means is provided for evaluating and comparing both current and new

solar heating and cooling designs. A secondary purpose of the portable laboratory (while it collects experimental data at many population centers) is to demonstrate solar heating and cooling concepts to interested public officials, the building trades, and the general public for educational purposes. GRA

N75-26513# American Transit Association, Washington, D.C.
PAPERS AND PROCEEDINGS OF TWO ENERGY CRISIS SEMINARS
John B. Schnell, Robert F. Comeau, and Karen R. Dinsdale Feb. 1975 111 p refs Prepared in cooperation with Amer. Public Transit Assoc., Inst. for Rapid Transit, and Urban Mass Transportation Admin.
(PB-239164/7; ATA-EC-75-1; UMTA-DC-06-0102) Avail: NTIS HC $5.25

Various aspects of the transit industry's ability to respond to the mobility needs and energy conservation needs of the country in the event of a severe energy shortage are presented. Some of the subjects treated in these papers include: operational techniques and procedures such as preferential transit treatments, busways, bus lanes, and fringe parking lots; fuel and energy conservation techniques: financial aspects; the resolution to interjurisdictional aspects of providing transit service when fuel is short for automobiles: national carpool/bus pool action plan; and UMTA's role in all of these activities. Other subjects included are rail transit - short and long range role in energy conservation and general subjects related to the severity of the energy problem and the allocation procedures as well as a presentation on mandatory allocation procedures. GRA

N75-26514# Army Electronics Technology and Devices Lab., Fort Monmouth, N.J.
NICKEL-ZINC BATTERIES FOR HYBRID VEHICLE OPERATION
Martin J. Sulkes Dec. 1972 58 p refs Sponsored by EPA
(PB-239710/7; EPA-460/3-74-025) Avail: NTIS HC $4.25 CSCL 10C

The characteristics of nickel zinc secondary batteries are evaluated and improved for use in hybrid electric vehicles. Properties which make the nickel zinc secondary battery a strong candidate for use in hybrid electric vehicle propulsion systems include: high energy density, a flat discharge, and the ability to charge and discharge at high rates and low temperatures. Short cycle life and high maintenance are considered problem areas for application of this battery to hybrid propulsion. GRA

N75-26515# Minnesota Univ., Minneapolis. Water Resources Research Center.
DIGEST OF ENERGY FACTS FOR WATER RESOURCES STUDIES IN MINNESOTA
William C. Walton Sep. 1974 84 p refs Sponsored by Dept. of Interior
(PB-239961/6; WRRC-Bull-74; OWRT-A-999-MINN(33)) Avail: NTIS HC $4.75 CSCL 10A

A digest is presented of available information concerning energy-water relationships, energy resources, consumption, sources, production, conservation, and environmental (including water resources) concerns which can serve as a background document for those who are interested in water resources and energy in Minnesota. GRA

N75-26516# National Center for Energy Management and Power, Philadelphia, Pa.
THE STUDY OF PRIORITIES IN THE ELECTRICAL ENERGY ALLOCATION PROBLEM
T. L. Saaty, C. N. Weygandt, and R. S. Mariano Jun. 1974 61 p refs
(Grant NSF GI-29729)
(PB-239762/8; NCEMP-27) Avail: NTIS HC $4.25 CSCL 10B

The problem of allocating electric energy for short periods during times of peak demand is treated. A methodology based on the assignment of priorities over classes of users of energy is applied. How these priorities are obtained and used to allocate electric power are illustrated. GRA

N75-26517# National Center for Energy Management and Power, Philadelphia, Pa.
AN ANALYSIS OF THE POTENTIAL FOR SHIFTING ELECTRIC POWER DEMAND WITHIN DAILY LOAD REQUIREMENT
Pocahontas Gey Lamb 1974 65 p refs
(Grant NSF GI-29729)
(PB-239764/4; NCEMP-29; NSF/RA/N-74-152(9)) Avail: NTIS HC $4.25 CSCL 10A

Data on estimated summer load curves of electric power demands of large commercial and industrial customers are analyzed for load flattening potential. Cost savings to the customers are determined. GRA

N75-26518# National Center for Energy Management and Power, Philadelphia, Pa.
THE PROSPECTS OF ENERGY DEMAND SCHEDULING
Francine Evelyn McQuade 1974 68 p refs
(Grant NSF GI-29729)
(PB-239763/6; NCEMP-28; NSF/RA/N-74-152(8)) Avail: NTIS HC $4.25 CSCL 10B

Industries were surveyed to consider the feasibility of a load shifting policy for electric power demands to delay the need for additional generation capability. Demand shifts would flatten out the daily load curve. The use of thermal energy storage systems is also discussed. GRA

N75-26519# National Center for Energy Management and Power, Philadelphia, Pa.
RESEARCH AND DEVELOPMENT OF LOW COST PROCESSES FOR INTEGRATED SOLAR ARRAYS Semiannual Progress Report, 15 Apr. - 30 Jun. 1974
V. Kapur, A. G. MacDiarmid, G. T. Noel, D. P. Pope, and M. Wolf Jul. 1974 106 p refs
(Grant NSF GI-29729)
(PB-239760/2; NSF/RANN/SE/GI-29729X/PR-74-2; NSF/RA/N-74-152(5); SAPR-1) Avail: NTIS HC $5.25 CSCL 10B

Potential processes for the production of low cost solar-grade silicon are reviewed and evaluated from a thermodynamic point of view. Preliminary experimental studies of a silicon purification process using the SiF4/SiF2 silicon transport reaction yielded a transport rate of 10 milligrams of silicon per liter of SiF4 at a flow rate of 20 liters per hour. Processes for the formation of thin large area crystalline silicon sheets are reviewed and assessed; hot rolling, growth from a binary melt, thermal cycle annealing, and zone melting are identified as processes requiring further study. An effort to develop a methodology for the comparative rating of candidate processes is discussed. GRA

N75-26520# National Center for Energy Management and Power, Philadelphia, Pa.
SOLAR COLLECTOR PERFORMANCE STUDIES
Noam Lior and Alan P. Saunders 1974 126 p refs
(Grant NSF GI-27976)
(PB-239758/6; NSF/RANN/SE/GI-27976/TR-73-1; NSF/RA/N-74-152(3)) Avail: NTIS HC $5.75 CSCL 10B

Comparative evaluation of 24 types of flat-plate solar collector configurations was performed. A dual-glass flat black collector type served as the test reference, and the other configurations were compared to it. In addition to the insolation collection tests, separate experiments were conducted to determine heat losses. The experimental facilities used are described. GRA

N75-26521# National Center for Energy Management and Power, Philadelphia, Pa.
CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING Final Summary Report
Manfred Altman and Hsuan Yeh 31 Jul. 1973 391 p refs
(Grant NSF GI-27976)
(PB-239395/7; NSF/RANN/SE/GI-27976/PR-73-5; NSF/RA/N-73-005-B) Avail: NTIS HC $10.25 CSCL 10B

The use of thermal energy storage and solar energy to provide comfort conditioning and off-peak air conditioning systems which perform much of the power consuming function at night are discussed along with materials for storing thermal energy. The marketing and economic conditions required for successful introduction of the novel systems are defined, and the effect of such systems on electric utilities is investigated. GRA

N75-26522# National Center for Energy Management and Power, Philadelphia, Pa.
CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING, EXECUTIVE SUMMARY Final Summary Report
Manfred Altman and Hsuan Yeh 31 Jul. 1973 31 p refs
(Grant NSF GI-27976)
(PB-239394/0; NSF/RANN/SE/GI-27976/PR-73-5; NSF/RA/N-73-005-A) Avail: NTIS HC $3.75 CSCL 10B

The technical and economic aspects of solar heating, off-peak air conditioning, and thermal energy storage were investigated. A solar heating system, which incorporates a conventional heating as a back-up, was designed. Twenty-four collector configurations were considered, and samples of the better ones were tested in the laboratory and under actual out-door insolation conditions. Two off-peak air conditioning systems were designed, and system prototypes were built and tested. Theoretical and experimental work was performed on latent heat energy storage materials and economic and marketing considerations for solar and off-peak space conditioning were explored. GRA

N75-26523# New York State Atomic and Space Development Authority, N.Y.
STUDY OF AN INTEGRATED POWER, WATER AND WASTEWATER UTILITY COMPLEX Final Report
Dec. 1974 238 p refs Sponsored by EPA
(PB-239408/8; EPA-670/2-74-080) Avail: NTIS HC $7.50 CSCL 10B

An approach is evaluated to siting power generation, wastewater treatment, and water supply facilities. It is concluded that the integrated facility results in more efficient utilization of land and water resources, produces a net reduction in undesirable process effluents, and achieves at a reduced cost many of the environmental quality goals sought today. The use of waste heat for the beneficiation of wastewater treatment was determined to be sufficiently promising to merit further investigatory research. GRA

N75-26524# Utah Univ., Salt Lake City. Div. of Materials Science and Engineering.
REFRACTORY MATERIALS FOR COAL-FUELED MHD POWER GENERATION Progress Report, 1 Jul. - 31 Dec. 1973
May 1974 30 p refs
(Grant NSF GI-34983)
(PB-239607/5; UTEC-MSE-74-068; NSF/RA/N-74-060; PR-4) Avail: NTIS HC $3.75 CSCL 11B

The slag corrosion resistance was investigated of refractory materials which may be used in MHD preheater units. The effort involved building new equipment and upgrading equipment already on hand, finding more suitable crucible materials for containment of the slag, improvement of the slag preparation technique, preparation of corrosion specimens, and continuation of corrosion studies. Materials tested were magnesite, chrome-magnesite, silicon carbide, and Al23 brick. Preparation of La(1-x)Sr(x)CrO3 electrodes is described. GRA

N75-26525# Mitre Corp., McLean, Va.
AN ANALYSIS OF CONSTRAINTS ON INCREASED COAL PRODUCTION Final Report
J. Bhutani, A. Brice, J. Elliott, D. Ellis, W. Jacobsen, J. Just, E. Krajeski, and J. Savadelis Jan. 1975 485 p refs
(Contract DI-14-01-0001-1937)
(PB-240613/0; MTR-6830) Avail: NTIS HC $12.00 CSCL 08I

Potential constraints on the nation's ability to significantly increase coal production are described. The analysis is based on the Project Independence Blueprint 'Business as Usual,' 'Intermediate,' and 'Accelerated' production scenarios through the year 1985. Appropriate action is recommended to eliminate or reduce the impact of the identified constraints. GRA

N75-26526# Scientific Software Corp., Englewood, Colo.
MER: ULTIMATE RECOVERY VS RATE. A RESERVOIR SIMULATION STUDY, VOLUME 1 Final Report
A. Richard Thachuk 7 Jun. 1974 130 p
(Contract DI-14-08-0001-13238)
(PB-239767/7; USGS-CD-74-002-Vol-1) Avail: NTIS HC $5.75 CSCL 08I

Procedures for technical maximum efficient rate (MER) determinations and regulations for oil and gas production are defined and quantified. Emphasis was placed on the determination of actual relationships for reservoirs with different properties and mechanisms using reservoir simulation techniques. Results for twenty different reservoir cases are presented and analyzed. Recommendations for procedures to determine MER's in the Federal Outer Continental Shelf are presented. GRA

N75-26527# Scientific Software Corp., Englewood, Colo.
MER: ULTIMATE RECOVERY VS RATE. A RESERVOIR SIMULATION STUDY. VOLUME 2: APPENDICES Final Report
A. Richard Thachuk 7 Jun. 1974 550 p
(Contract DI-14-08-0001-13238)
(PB-239768/5; USGS-CD-74-003-Vol-2) Avail: NTIS HC $12.50 CSCL 08I

For abstract, see N75-26526.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-26528 British Library Lending Div., Boston Spa (England).
SOLIDS EMISSION FROM POWER STATION FURNACES
A. Kantner [1974] 18 p refs Transl. into ENGLISH from VGB Scand. Conf., Goteburg, 13-14 Sep. 1973
(BLL-CE-Trans-6524-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Production and control of soot, flycoke and acid smut emissions from oil fired furnaces are studied. Installations of electrostatic dust precipitors and recording dust content meters are recommended for continuous monitoring of combustion products. An evaluation of gaseous and liquid fuels in regard to their soot forming characteristics is advocated. G.G.

N75-26529 British Library Lending Div., Boston Spa (England).
PROBLEMS OF ATMOSPHERIC POLLUTION
H. W. Georgii 14 May 1974 11 p refs Transl. into ENGLISH from Z. Physik. Medizin (West Germany), May 1970 p 234-242
(BLL-CE-Trans-5910-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Various air pollutants and their effects on climate and public health are discussed, with particular attention to carbon dioxide and sulfur dioxide. Concentration measurements and global distribution analyses are presented for these compounds. D.M.L

N75-26530# Louisville Univ., Ky.
FATE AND EFFECTS OF OIL POLLUTANTS IN EXTREMELY COLD MARINE ENVIRONMENTS Annual Report, 1974
Ronald M. Atlas 31 Dec. 1974 39 p refs
(Contract N00014-74-A-0180-0001)
(AD-A003554) Avail: NTIS CSCL 13/2

The biodegradability of different crude oils depended on their composition and temperature. Heavier oils were more resistant to biodegradation, but lighter oils, while more susceptible to degradation at warm temperatures, contained volatile components that inhibited crude oil mineralization at reduced temperatures. It was possible to stimulate degradation of Prudhoe crude oil by fertilization and microbial seeding. Success of stimulated biodegradation depended on providing sufficient nutrients for extensive microbial metabolism in an oleophilic form and on the presence of appropriate oil degrading microorganisms for the given ecosystem. Microbial degradation did not increase toxicity to invertebrate test organisms. Amphipods were only killed by direct physical contact with oil slicks. The seed Pseudomonas sp. was not pathogenic or toxic to the bioassay organisms. Petroleum was found to inhibit microbial photosynthesis and nitrogen fixation, but not respiration. Chronically polluted areas had abnormally high numbers of fungi and low numbers of bacteria. Pristine Alaskan waters all contained microorganisms capable of oil biodegradation. GRA

N75-26531# Environmental Health Lab., Kelly AFB, Tex.
INDUSTRIAL HYGIENE SURVEY, 110TH TACTICAL SUPPORT GROUP, MI ANG BATTLE CREEK, MI 49016 Final Technical Report
Lawrence W. Grauvogel Dec. 1974 44 p refs
(EHL Proj. K-74-11)
(AD-A003638; EHL(K)-74-28) Avail: NTIS CSCL 06/10

At the request of the 110th Tactical Support Group, MI ANG, Battle Creek MI 49016 and as directed by AFLC/SGB a hazardous noise and industrial hygiene survey was conducted 9-12 September 1974. Personnel exposed to potentially hazardous noise and sources and areas of potentially hazardous noise are identified by shop. Ventilation is discussed for the shops. Comprehensive listings by shop of chemicals used and compositions are included to and the physician in identification of the possible source of occupational illnesses encountered. Recommendations for use of ear protection and other protective equipment and alterations in ventilation systems, especially for the vehicle spray painting facility, are summarized by shop. The unit operates O-2 aircraft. GRA

N75-26532# Naval Postgraduate School, Monterey, Calif.
THE ECONOMICS OF THE WEST COAST OIL SPILL CLEAN-UP INDUSTRY M.S. Thesis
Christopher M. Stone Dec. 1974 78 p refs
(AD-A003860) Avail: NTIS CSCL 05/3

The purpose of this thesis is to examine the industrial structure in oil spill clean-up activity. The study concludes that the commercial sector, the forerunner in clean-up activity, is being supplemented with private, or in-house capability as well as non-profit and public clean-up. However, each sector remains a viable part of the total clean-up effort, with each catering to different areas of demand. GRA

N75-26533# Texas A&M Research Foundation, College Station.
VLCC METULA OIL SPILL Final Report
Roy W. Hann, Jr. Dec. 1974 69 p
(Contract DOT-CG-42444-A)
(AD-A003805; USLG-D-54-75) Avail: NTIS CSCL 13/2

On 9 August 1974, the METULA, a 206,000 deadweight VLCC (Very Large Crude Carrier) enroute from Ras Tenura, Saudi Arabia to Quintera Bay, Chile with a load of 195,673 tons of Arabia light crude, ran aground on the Satellite Patch Shoal in the Straits of Magellan, Chile. The author was detailed by the U.S. Coast Guard to proceed to the spill site to serve in the capacity of Science Advisor to the U.S. National Strike Force sent to assist the Chilean government abate the spill. This report summarizes: History of the spill; deposition of oil on the shore; impact of the oil on the shore; comments regarding feasibility of containment, cleanup or stabilization. GRA

N75-26534# Naval Ordnance Lab., White Oak, Md.
DEFENSE TECHNOLOGY FOR ENVIRONMENTAL PROTECTION Interim Report, Jun. 1973 - Jun. 1974
Eldon A. Byrd and Sherman Gee 1 Jul. 1974 69 p refs
Sponsored in part by Natl. Environmental Res. Center, Res. Triangle Park, N.C.
(NOL Proj. 830-X01-12)
(AD-A003434; NOLTR-74-174) Avail: NTIS CSCL 13/2

This report presents the status of work completed in 1973-1974 to identify and assess the extent to which defense technology in Department of Defense laboratories and centers, is applicable toward helping meet technological requirements in air pollution monitoring and control, and to initiate specific transfer actions as appropriate. A bibliography is being compiled, and a compendium of laboratory capabilities is included. Specific technology transfer actions initiated in this period are also described. GRA

N75-26535# Coast Guard Research and Development Center, Groton, Conn.
OIL SPILL IDENTIFICATION SYSTEM Interim Report
Oct. 1974 88 p refs
(AD-A003803; CGR/DC-31/74; USCG-D-41-75) Avail: NTIS CSCL 13/2

The U.S. Coast Guard Research and Development Center has developed a system for forensic identification and classification of oil spills. This system is comprised of procedures for sampling, sample transmittal and four independent analytical techniques: infrared and fluorescence spectroscopy, gas chromatography, and thin-layer chromatography. Each analytical technique has been developed to a high degree of reliability and its effectiveness tested under controlled conditions (simulated spills and weathering). The methods were tested in ten simulated spills involving 63 samples. Probabilities for each method were: Infrared 0.944, Fluorescence 0.911, Gas Chromatography 0.911, Thin-Layer Chromatography 0.629. The combined probability for all techniques was 99.9%. The merits of the identification system have been demonstrated in thirty-eight real world spill cases. In every case, all analytical methods agreed on one source as responsible for the oil spill. In all verifiable cases (approx. 25%) the analytical methods identified the true source. GRA

N75-26536# Washington Univ., Seattle. Dept. of Mechanical Engineering.
AN ANALYTICAL INVESTIGATION OF FLUID CARGO VAPOR DISPERSION Final Report
J. H. Chou and R. C. Corlett Nov. 1974 77 p refs
(Contract DOT-CG-34075-A)
(AD-A004487; USCG-D-59-75) Avail: NTIS CSCL 13/10

Means for analytical prediction of the dispersion field of toxic or combustible vapor vented from a tanker are critically evaluated. Particular emphasis is given the conservative delineation of the flammable surface separating spatial domains outside of which dangerous combustion is unlikely and inside of which it is (and an analogous toxic surface) in the light of normal available data and the uncertainties therein. Approximate analyses covering buoyancy and jet momentum effects are included. The problem of assignment of appropriate flammability limits in a turbulent and inhomogeneous mixture is reviewed. Experimental and analytical means of dealing with flow past obstacles and other geometrically complex phenomena are evaluated. The effects of helicopter downwash on vapor dispersion is also briefly analyzed. Finally, the procedure for analysis of vapor dispersion within tanks is outlined. GRA

N75-26537# Army War Coll., Carlisle Barracks, Pa. Strategic Studies Inst.
ECOSTRATEGY: THE ECOLOGICAL CRISIS AND NATIONAL SECURITY, REVISED
Erwin R. Brigham 15 Dec. 1974 31 p refs Revised
(AD-A004261; MIRM-74-8-Rev) Avail: NTIS CSCL 15/3

Ecological problems have escalated to the global, crisis level, and have become strategically significant within the past five to ten years. U.S. armed forces produce some ecological problems that are unique, and criticism of the armed forces: role vis-a-vis ecology was a factor in the abandonment of biological weapons, brought on major restrictions of chemical weapons, and made nuclear weapons the most severely controlled. Whether or not there is direct, large-scale involvement by the U.S. military to alleviate environmental problems, various aspects of the ecological crisis will affect national security in numerous ways. Expenditures for ecological programs will both increase the cost of military materiel and operations and reduce funds available for defense purposes. Other elements of the ecological crisis which cannot be precisely evaluated bear on the nation's general well-being and upon its national security. GRA

N75-26538# Research Triangle Inst., Durham, N.C.
DEVELOPMENT OF METHOD FOR CARCINOGENIC VAPOR ANALYSIS IN AMBIENT ATMOSPHERES Final Report, Jul. 1973 - Jul. 1974
Edo E. Pellizzari Jul. 1974 162 p refs
(Contract EPA-68-02-1228)
(PB-239770/1; EPA-650/2-74-121) Avail: NTIS HC $6.25 CSCL 07D

Analytical techniques and instrumentation were developed and evaluated for the collection and analysis of carcinogenic and mutagenic vapors occurring in ambient air. The areas of investigation included: the design and testing of a cartridge sampler for concentrating trace quantities (ng/cubic meters) of hazardous substances from air; the design, fabrication, and evaluation of a thermal desorption inlet-manifold for recovering vapors trapped on an analyte and sample transfer into an analytical system; the evaluation of thermal desorption as a technique for recovering hazardous vapors from sorbents; and the development

and performance of a field sampling system for collecting trace quantities of vapors. GRA

N75-26539# KVB Engineering, Inc., Tustin, Calif.
IN-STACK CONTINUOUS MONITORING OF EMISSIONS FROM STATIONARY SOURCES Final Report, Jan. 1974 - Jan. 1975
K. W. Arledge, W. Carter, L. G. Hays, and S. E. Kerho Jan. 1975 107 p refs
(PB-239693/5; KVB-5801-199; ARB-R-3-733-75-32) Avail: NTIS HC $6.25 CSCL 07D

The status of technology of continuous monitors for emissions from stationary sources in California was investigated. About 700 sources were identified which had emissions of 100 tons/year or more of the contaminants considered (NOx, SO2, CO, particulates, hydrocarbons), and which were suitable for installation of a continuous monitor. Systems of stated reliability and moderate cost ($10,000 to $20,000) were found to be available from several manufacturers. Direct reading of the mass rate of emissions and electronic data handling and storage were found to be feasible, effective options. Examples of specific applications of both in situ and extractive systems were prepared and are presented. GRA

N75-26540# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
REMOTE SENSING OF POLLUTANTS. COMPUTERIZED REDUCTION OF LONG PATH ABSORPTION DATA Final Report
V. E. Derr, M. H. Ackley, M. J. Post, and R. F. Calfee Jul. 1974 201 p refs
(Contract EPA-IAG-077(D))
(PB-240168/5; EPA-650/2-74-113) Avail: NTIS HC $7.25 CSCL 07D

The physical, mathematical, and calculational principles and procedures are described for the use of a digital computer program to determine concentrations of atmospheric gases in a path of a few kilometers. Detailed instructions for the computer program and a library of spectra are provided. GRA

N75-26541# National Environmental Research Center, Research Triangle Park, N.C. Quality Assurance and Environmental Monitoring Lab.
AN EVALUATION OF ARSENITE PROCEDURE FOR DETERMINATION OF NITROGEN DIOXIDE IN AMBIENT AIR Final Report
Michael E. Beard and John H. Margeson Nov. 1974 44 p refs
(PB-239727/1; EPA-650/4-74-048) Avail: NTIS HC $3.75 CSCL 07B

The report describes and evaluates the sodium arsenite manual procedure for measurement of NO2 in ambient air. The evaluation included ruggedness testing, as described by Youden. The method involves sampling for 24 hours with a restricted-orifice bubbler immersed in a NaAsO2-NaOH collecting solution. The range of the method is approximately 20 to 750 micrograms/cum. The method was insensitive to normal variations in orifice bubbler diameter, temperature of the absorbing solution during sampling, and concentration of arsenite. However, the ruggedness test identified NO and CO2 as positive and negative interferents, respectively; sample flow rate may also be a variable affecting the method response. GRA

N75-26542# TRW Systems, Redondo Beach, Calif.
ASSESSMENT OF CATALYSTS FOR CONTROL OF NOx FROM STATIONARY POWER PLANTS. PHASE 1, VOLUME 1 Final Report
E. P. Koutsoukos, J. L. Blumenthal, M. Ghassemi, and G. Bauerle Jan. 1975 226 p refs
(Contract EPA-68-02-0648)
(PB-239745/3; EPA-650/2-75-001A) Avail: NTIS HC $7.25 HC also available from NTIS $15.00/set of 2 reports as PB-239744-SET CSCL 07A

Results are summarized of investigations to assess the technical and economic feasibility of using catalytic processes in power plant nitrogen oxide (NOx) emission abatement. The investigations involved a literature survey and the development of a data band on pertinent articles and patents, experimental screening tests on selected promising catalysts, and preliminary design and cost analysis of candidate processes adapted to new and/or existing power plants. Catalytic NOx control processes that are adaptable to power generating plants are selective reduction of NOx with ammonia on non-noble metal catalysts; and simultaneous nonselective reduction of NOx and sulfur oxides and coal-derived reductants on non-noble metal catalysts. GRA

N75-26543# TRW Systems, Redondo Beach, Calif.
ASSESSMENT OF CATALYSTS FOR CONTROL OF NOx FROM STATIONARY POWER PLANTS. PHASE 1, VOLUME 2: DATA BANK CITATION INDICES Final Report
E. P. Koutsoukos, J. L. Blumenthal, M. Ghassemi, and G. Bauerle Jan. 1975 268 p
(Contract EPA-68-02-0648)
(PB-239746/1; EPA-650/2-75-001b) Avail: NTIS HC $8.50 HC also available from NTIS $15.00/set of 2 reports as PB-239744-SET CSCL 07A

Computer printouts representing three indices of the 'Catalytic NOx Abatement Data Bank' developed for the 'Technical and Economic Assessment of Catalysts for Control of NOx from Stationary Power Plants' Program are presented. The data bank contains documents selected from the following areas of NOx and NOx-SOx research and development literature: decomposition and oxidation of NOx; selective and nonselective catalytic NOx reduction with actual or synthetic flue gases and internal combustion engine exhaust; ammonia decomposition and oxidation; preparation procedures for NOx abatement catalysts; simultaneous NOx-SOx abatement; economic and engineering analyses on NOx-SOx control processes proposed for power plant or related source utilization. GRA

N75-26544# National Environmental Research Center, Research Triangle Park, N.C. Meteorology Lab.
USER'S GUIDE FOR HIWAY, A HIGHWAY AIR POLLUTION MODEL Final Report
John R. Zimmerman and Roger S. Thompson Feb. 1975 68 p refs
(PB-239944/2; EPA-650/4-74-008) Avail: NTIS HC $4.25 CSCL 13B

A computer model, called HIWAY, that can be used for estimating the concentrations of non-reactive pollutants from highway traffic is described. This steady state Gaussian model can be applied to determine air pollution concentrations at receptor locations downwind of at-grade and cut-section highways located in relatively uncomplicated terrain. The air pollution concentration representative of hourly averaging times at a downwind receptor location is found by a numerical integration along the length of each lane and a summing of the contributions from each lane. With the exception of receptors directly on the highway or within the cut, the model is applicable for any wind direction, highway orientation, and receptor location. The model was developed for situations in which horizontal wind flow occurs. The model cannot consider complex terrain or large obstructions to the flow such as buildings or large trees. GRA

N75-26545# Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
EPA SYMPOSIUM: ALTERNATIVE CHEMICALS PROGRAM WITH AN OVERVIEW OF PESTICIDE RESEARCH AND DEVELOPMENT
Aug. 1974 323 p Symp. held at Denver, 14-16 Aug. 1974
(PB-239416/1; EPA-540/9-75-002) Avail: NTIS CSCL 13B

Papers are presented which deal with such related areas as: purpose, organization, and operation of the substitute chemicals program; initial scientific, mini-economic, biosphere, and socioeconomic reviews; progress in EPA research - new directions; worldwide pesticide research and perspectives; U.S. participation in Codex; prerequisite conditions for determination and efficient realization of substitute chem. program in some European and developing countries; pesticide monitoring program; overview of ecological effects; terrestrial effects, marine life, and fresh water effects; systems analysis as a tool for research program design; intra- and extramural health effects research and long-range health effects. GRA

N75-26546# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
DESIGNATION OF UNACCEPTABLE ANALYTICAL METHODS OF MEASUREMENT FOR CRITERIA POLLUTANTS
Sep. 1974 44 p refs
(PB-239584/6; EPA-450/4-74-005; OAQPS-1.2-018) Avail: NTIS HC $3.75 CSCL 13B

Pollution monitoring methods are placed into one of three categories approved-Federal Reference Method (FRM) or equivalent; unapproved - not yet determined to be equivalent to the FRM; and unacceptable - known to yield measurements of poor accuracy and reliability and in most cases obsolete. GRA

N75-26547# Economics and Science Planning, Inc., Washington, D.C.
RECOMMENDED US AUTOMOTIVE EMISSION STANDARDS
3 Feb. 1975 38 p refs Sponsored by NSF
(PB-240346/7) Avail: NTIS HC $3.75 CSCL 13B

It is suggested that a 49-state automotive emission standard of 2,20,3.1 will meet ambient air quality standards where they can be met. It is also indicated that the ambient air quality achieved by the Federal Interim Standards of 1.5,15,3.1 will not achieve an air quality that is measurably better than the suggested standards. Additionally, it is suggested that reducing allowable lead additives to approximately 1 gram/gallon from the national level of 2.5 grams will meet ambient air quality requirements for that pollutant. GRA

N75-26548# National Ecological Research Lab., Corvallis, Oreg.
A CONCEPTUAL MODEL FOR THE MOVEMENT OF PESTICIDES THROUGH THE ENVIRONMENT Final Report
James W. Gillet, James Hill, IV, Alfred W. Jarvinen, and W. Peter Schoor 1 Nov. 1974 90 p refs
(PB-240309/5; EPA-660/3-74-024) Avail: NTIS HC $4.75 CSCL 13B

A conceptual model of the movement and disposition of pesticides in the environment is presented. A multi-media model is built up from simple modules representing basic processes and components of air, soil, and water. More specific models are exposited for the atmospheric/terrestrial, freshwater aquatic, and estuaring/marine environments. Ultimately systems analysis and mathematical simulation techniques can be employed to evaluate the fate of a specific chemical in a particular environment. The conceptual model is thus a first step in organizing facts, assumptions, and hypotheses into a graphic and logical arm capable of exploitation in further experimentation of pesticide disposition and effects. While rejecting formulation of a model with global validity, the authors emphasize the commonalities of the basic processes and components in the various environments. GRA

N75-26549# National Environmental Research Center, Cincinnati, Ohio.
NEWS OF ENVIRONMENTAL RESEARCH IN CINCINNATI, JANUARY - DECEMBER 1974
Mar. 1975 69 p refs
(PB-240131/3; EPA-670/9-75-003) Avail: NTIS HC $4.25 CSCL 13B

A series of brief reports is presented on the following subjects: impact of environmental control technologies on the energy crisis; advanced wastewater treatment plant at Piscataway, Maryland; identifying organic pollutants in water; survival of fecal coliforms and fecal streptococci in a sanitary landfill; sludge incineration and fuel conservation; producing protein while reducing waste; a new cell line for recovering viruses from water; rapid toxicological screening of environmental pollutants; a swirl device for regulating and concentrating combined sewer overflows; recreational water quality criteria; granular media filtration of secondary effluent; and coal refuse disposal in the eastern United States. GRA

N75-26550# Arizona Univ., Tucson. Office of Arid Lands Studies.
THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES IN ARID LANDS. LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY
Charles Bowden Jan. 1975 288 p refs
(Contract DI-14-31-0001-4258)
(PB-240008/3; Resource-IP-6; OWRT-W-180(4258)(1)) Avail: NTIS HC $8.75 CSCL 13B

Water is basic to energy conversion systems, natural and man-made. Consequences of energy extraction and conversion in arid lands where water is scarce are explored. The historical past is utilized as a record for casting modern development plans into perspective; the worldwide growth in energy consumption rates is considered as the motive force behind many current energy projects in arid lands. Energy sources (coal, oil, gas, oil shale, solar energy, alternative energy sources, fission, fusion, and geothermal) are reviewed in terms of their consequences on the air, land, water, and inhabitants of such regions. Two rivers, the Colorado and the Missouri, provide small-scale models of the rewards and hazards of heavily exploiting water-short areas. In both instances, energy development plans, as now proposed, will seriously deplete the water supply, alter the quality of the water, land, and air, and increase the human population. GRA

N75-26551# Snell (Foster D.), Inc., Florham Park, N.J.
SYSTEM ANALYSIS OF AIR POLLUTANT EMISSIONS FROM THE CHEMICAL/PLASTICS INDUSTRY Final Report, Mar. 1973 - Mar. 1974
Herbert Terry and Stephen Nagy Oct. 1974 281 p refs
(Contract EPA-68-02-1068)
(PB-239880/8; EPA-650/2-74-106) Avail: NTIS HC $8.75 CSCL 13B

Chemical/plastics industry producers, production volume, forecasted growth rates, plant capacities and locations, and average population densities at each plant site are listed. Equipment, reaction conditions, specific process chemicals and general air pollution controls are described. A decision model is used to relate the interactions of such factors as total population exposed, production volume, growth trends, emission, odor, and hazard potential of the most likely pollutants. Polyurethanes, acrylics, and alkyds are the most likely candidates for in-depth study of emissions factors, emission controls, and emission control costs. Similar information is given for some high-volume plastic materials: polyethylene, polystyrene, polypropylene, nylon, and polyvinyl chloride. Most of the pollution control devices used in the industry are associated with large volume resin manufacture and function primarily to recover product or heat values: in most instances, economics dictate against installing control devices solely for pollution. Calculated costs are given for various controls. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-26552 Colorado Univ., Boulder.
A TWO-DIMENSIONAL TRANSPORT MODEL OF THE ATMOSPHERE
Jean-Francois Louis 1974 165 p
Avail: Univ. Microfilms Order No. 75-13442

A two dimensional transport model of the atmosphere from 0 to 50 km is developed. Advection by the mean meridional circulation and diffusion by the large scale eddies are included. Mean winds above 15 km are computed by solving the thermodynamic and continuity equations. The diffusion coefficients consistent with the mean circulation are deduced from the observed distribution of ozone and its vertical flux. The model was tested by simulating the behavior of tungsten-185 from low latitude United States nuclear tests, and zirconium 95 from high latitude Chinese nuclear tests. The overall distribution of the tracers, their rate of spreading, the rate of decrease of the maximum concentration, the residence time of the stratospheric burden, and the deposition by wet fall-out are well simulated and agree qualitatively and quantitatively with observations. Dissert. Abstr.

N75-26553 Stanford Univ., Calif.
A THEORETICAL STUDY OF ELECTRICAL COUPLING BETWEEN THE TROPOSPHERE, IONOSPHERE AND MAGNETOSPHERE Ph.D. Thesis
Mongkol Dejnakarintra 1975 213 p
Avail: Univ. Microfilms Order No. 75-13510

Electrical coupling between the earths lower atmosphere and the ionosphere is investigated theoretically as a three dimensional boundary value problem. Theories are developed for mapping dc and ultralow frequency electric fields in model atmospheres. These theories are then applied to two coupling problems: (1) upward mapping of thundercloud electric fields to the ionosphere and the magnetosphere, and (2) downward mapping of ionospheric electric fields to the lower atmosphere. Sample calculations indicate that giant thunderclouds can produce transverse dc electric fields of hundreds of microvolts per meter in the ionosphere, large enough to play an important role in the formation of field-aligned electron density irregularities in the ionosphere and magnetosphere. It was also found that attenuation of ionospheric electric fields as they map down into the lower atmosphere decreases markedly with increased field size. These results indicate that electrical coupling between the lower atmosphere and the ionosphere is much stronger than previously believed. Dissert. Abstr.

N75-26554*# Texas Univ., Dallas.
[PLANETARY ATMOSPHERE PARAMETERS AND OGO-6 DATA AND PLOTS] Semiannual Status Report, period ending 15 Mar. 1975
F. S. Johnson Jun. 1975 42 p refs
(Grant NGL-44-004-026)
(NASA-CR-142964) Avail: NTIS HC $3.75 CSCL 04A

Some OGO-6 observations of the upper atmosphere, planetary atmospheric gases, thermospheric particle concentrations, and ion temperature of planetary ionospheres are examined. E.H.W.

N75-26555*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
DIELECTRIC PROPERTIES OF SOILS AS A FUNCTION OF MOISTURE CONTENT
Josef Cihlar and Fawaz T. Ulaby, Nov. 1974 61 p refs
(Contract NAS9-10261)
(NASA-CR-141868; RSL-TR-177-47) Avail: NTIS HC $4.25 CSCL 08M

Soil dielectric constant measurements are reviewed and the dependence of the dielectric constant on various soil parameters is determined. Moisture content is given special attention because of its practical significance in remote sensing and because it represents the single most influential parameter as far as soil dielectric properties are concerned. Relative complex dielectric constant curves are derived as a function of volumetric soil water content at three frequencies (1.3 GHz, 4.0 GHz, and 10.0 GHz) for each of three soil textures (sand, loam, and clay). These curves, presented in both tabular and graphical form, were chosen as representative of the reported experimental data. Calculations based on these curves showed that the power reflection coefficient and emissivity, unlike skin depth, vary only slightly as a function of frequency and soil texture. Author

N75-26556*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOT, COLD, AND ANNUAL REFERENCE ATMOSPHERES FOR EDWARDS AIR FORCE BASE, CALIFORNIA (1974 VERSION)
D. L. Johnson Jul. 1975 111 p refs
(NASA-TM-X-64941) Avail: NTIS HC $5.25 CSCL 04A

Reference atmospheres pertaining to summer (hot), winter (cold), and mean annual conditions for Edwards Air Force Base, California, are presented from surface to 90 km altitude (700 km for the annual model). Computed values of pressure, kinetic temperature, virtual temperature, and density and relative differences of the atmospheric parameters versus altitude are tabulated in 250 m increments. Hydrostatic and gas law equations were used in conjunction with radiosonde and rocketsonde thermodynamic data in determining the vertical structure of these atmospheric models. The thermodynamic parameters were subjected to a fifth degree least-squares curve-fit procedure, and the resulting coefficients were incorporated into Univac 1108 computer subroutines so that any quantity may be recomputed at any desired altitude using these subroutines. Author

N75-26557*# Kanner (Leo) Associates, Redwood City, Calif.
RELATIVE CONCENTRATION OF WATER VAPOR IN THE MESOSPHERE OF THE ARCTIC LATITUDES AND MID-LATITUDES OF THE USSR AS MEASURED BY RADIOFREQUENCY MASS SPECTROMETERS
E. D. Byuro and G. M. Martynkevich Washington NASA Jun. 1975 17 p refs Transl. into ENGLISH from Tr., Nauchn. Soveshchaniye po Mezosfernym Oblakam (Riga), 1970 p 25-36
(Contract NASw-2481)
(NASA-TT-F-16413) Avail: NTIS HC $3.25 CSCL 04A

Rocket-borne radio frequency mass spectrometers were used to study the neutral composition of the thermosphere over arctic and mid-latitude regions of the U.S.S.R. during the period from October, 1966 to March, 1968. The measured concentrations of atomic hydrogen were from 2.5 to 20 times larger than predicted by existing models. The concentration of atomic hydrogen at the altitudes 100 to 160 km in the arctic was much larger than in the mid-latitude regions. Layers of increased water vapor content were observed over both the arctic and mid-latitude regions. There is evidence to suppose that water vapor and oxygen-hydrogen complexes in the mesopause are formed by the action of solar wind. Author

N75-26558# Joint Publications Research Service, Arlington, Va.
GRAVITATIONAL ACCELERATION AT SEA. TWO ALTITUDE PROBLEM SOLUTION
A. B. Chernyshev and G. N. Lyalin 20 Jun. 1975 18 p Transl. into ENGLISH from Morskoy Sb. (Moscow), no. 6, 1967 p 74-77 and no. 10, 1968 p 53-61
(JPRS-65054) Avail: NTIS HC $3.25

The determination of gravitational acceleration at sea, and the mathematical solution of the navigational two-altitude problem for stellar autonavigators are discussed. Author

N75-26559# Weapons Research Establishment, Salisbury (Australia).
THE EFFECT OF THE EARTH'S ATMOSPHERE ON BASELINE DETERMINATIONS BY VERY LONG BASELINE INTERFEROMETRY
K. J. W. Lynn and J. S. Gubbay Jan. 1975 22 p refs
(WRE-TN-1312(WR/D)) Avail: NTIS HC $3.25

A Very Long Baseline Interferometry (VLBI) experiment using radio waves is presented. Changes in phase path through the earth's atmosphere introduce frequency offsets which appear in the observed fringe frequency. Errors in the prediction of these offsets currently limit the accuracy with which baseline parameters may be determined by VLBI. Atmospheric modelling techniques used in correcting for the effects of the earth's atmosphere (both the neutral and ionized layers) are described. The various components making up the atmospheric correction are evaluated and compared for realistic observing conditions. The effect on baseline accuracy of a residual error in the determination of the atmospheric correction is estimated. Author

N75-26560# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THEORY OF AURORA FORMATION
Akira Hasegawa Apr. 1975 13 p refs
(Grant NSF OIP-74-12932)
(IPPJ-219) Avail: NTIS HC $3.25

A theory of aurora formation is presented based on Alfven wave-electron interaction. The theory explains consistently the electron acceleration process, the formation of auroral layers and the long wave formation in the longitudinal direction. Author

N75-26561# Ludwig-Maximilians-Universitat, Munich (West Germany). Abteilung fuer Atmosphaerische Strahlung und Satellitenmeteorologie.
AIRCRAFT AND BALLOON BORNE SPECTRAL RADIOMETERS Final Report [SPEKTRALRADIOMETER FUER FLUGZEUG- UND BALLONEINSATZ]
Karl-Theodor Kriebel, Friedrich Koepp, Hans-Juergen Bolle, and Volker Mann (DFVLR, Oberpfaffenhofen, West Ger.) Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1974 29 p refs In

GERMAN; ENGLISH summary
(Contract WRK-174)
(BMFT-FB-W-74-11) Avail: NTIS HC $3.75; ZLDI, Munich DM 6.10

Three spectroradiometers were developed for earth survey and cloud studies as well as indirect soundings. One of the instruments, an eight channel step scan radiometer was flown in South West Africa for measurements of the radiation field reflected at the ground and albedo determination. The other two instruments, a three channel radiometer for cloud studies and a 2 x 4 channel radiometer for indirect soundings are currently under test. Author (ESRO)

N75-26562# Ludwig-Maximilians-Universitat, Munich (West Germany). Abteilung fuer Atmosphaerische Strahlung und Satellitenmeteorologie.
OCCULTATION EXPERIMENT FOR THE DETERMINATION OF THE O2 DENSITY PROFILE IN THE THERMOSPHERE Final Report [OKKULTATIONSEXPERIMENT ZUR BESTIMMUNG DES O2-DICHTEPROFILS IN DER THERMOSPHAERE]
Hans-Juergen Bolle, Lothar Bierling, and Volker Aman (DFVLR, Oberpfaffenhofen, West Ger.) Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1974 17 p ref In GERMAN; ENGLISH summary
(Contract WRK-234)
(BMFT-FB-W-74-12) Avail: NTIS HC $3.25; ZLDI, Munich DM 3.60

The transmission in a horizontal occultation path through the atmosphere was measured in the Schumann continuum of O2 by means of a rocket experiment with a sun stabilized two channel radiometer. By application of an inversion procedure the vertical profile of the molecular oxygen distribution is deduced from these data in the altitude region from 150 to 240 km. Slightly smaller O2 number densities are obtained than predicted by the CIRA (1965) atmosphere. Author (ESRO)

N75-26563# Information Design, Inc., Bedford, Mass.
PICTORIAL ANALYSIS OF CHEMICAL SMOKE TRAILS TO CHARACTERIZE A WIND FIELD IN THE 15-30 KM ALTITUDE RANGE Final Report, 15 Mar. 1973 - 15 Mar. 1974
Glen D. Wilson, Otis Philbrick, Sheldon B. Michaels, and Jeffrey S. Morris Mar. 1974 9 p refs
(Contract F19628-73-C-0224; AF Proj. 6392)
(AD-A003665; AFCRL-TR-74-0381) Avail: NTIS CSCL 04/2

Process programs were developed for interactive acquisition and reduction of data from photographs of chemical smoke trails to measure winds and wind shears in the 15-30Km altitude range. GRA

N75-26564# Army Electronics Command, Fort Monmouth, N.J.
VISUAL OBSERVATION OF PROPAGATING GRAVITY WAVES ON ATS 3 SATELLITE FILM LOOPS
J. E. Thomas, M. D. Kays, J. D. Horn, and R. L. Moore Jan. 1975 28 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A003843; ECOM-5553) Avail: NTIS CSCL 04/1

This paper deals with the observation of gravity waves from meteorological satellites. The methodology for viewing the waves is given and the statistics for a 395-day period are presented. The gravity waves described have been previously observed and reported in the literature through cloud observations from the ground. The alternating light and dark lines identified as propagating gravity waves are thought to result from condensation and dynamic compression of atmospheric moisture. The gravity waves are shown to travel in the same average direction as F-region ionospheric events. GRA

N75-26565# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
COMPARISON OF TWO SEGMENT MAXIMUM LIKELIHOOD (TSML) FREQUENCY WAVENUMBER SPECTRA WITH THE FAST BEAMED FREQUENCY WAVENUMBER SPECTRA (FKPLOT)
J. W. Lambert and Z. A. Der 9 May 1974 114 p refs
(Contract F08606-74-C-0006; ARPA Order 1620)
(AD-A003481; SDAC-TR-74-6) Avail: NTIS CSCL 17/10

Empirical comparison of the two segment maximum likelihood f-k spectra with fast frequency domain beam f-k spectra (FKCOMB), FKPLOT) shows that the latter is more suitable for the separation of multiple signals if the amplitudes of the signals differ considerably. This advantage of the beaming process is attributed primarily to the stripping procedure, which has not been developed for the maximum likelihood spectra. The maximum likelihood f-k spectra, on the other hand, are less sensitive to the array response and easier to interpret, especially if the array used contains only a few elements, since the sidelobes of the array response are more confusing on the FKCOMB output of this case. GRA

N75-26566# Naval Research Lab., Washington, D.C.
THE AERONOMY OF ODD NITROGEN IN THE THERMOSPHERE
E. S. Oran, P. S. Julienne, and D. F. Stroebel Dec. 1974 45 p refs
(NRL Proj. A03-16; RR03024253)
(AD-A003480; NRL-MR-2963) Avail: NTIS CSCL 04/1

A model for the aeronomy of odd nitrogen in the thermosphere is constructed that satisfactorily describes the available measurements of odd nitrogen species. Based on theoretical considerations of the molecular processes associated with N2(+) + O to NO(+) + N and N2 dissociation by electron impact and euv radiation between 800-1000 A, it is argued that essentially every reaction of N2(+) + O leads to the formation of N(doublet D) and that the latter processes proceed through the same intermediate states which predissociate to form one N(doublet D) and one N(quartet S) atom. The model predicts NO delta (0,0) band emission in good agreement with the measurements by Feldman and Takacs. GRA

N75-26567# Indiana Univ., Bloomington. Dept. of Chemistry.
ELEMENTARY REACTIONS OF THE UPPER ATMOSPHERE Final Report
Edward J. Bair 1974 6 p
(Grant AF-AFOSR-1903-70; AF Proj. 9538)
(AD-A003747; AFOSR-75-0026TR) Avail: NTIS CSCL 07/5

Mechanisms of photochemical decomposition of ozone and hydrozoic acid are summarized. A list of publications resulting from this research is included. GRA

N75-26568# General Electric Co., Santa Barbara, Calif. DASIAC
REACTION RATE DATA, NUMBER 47
Jul. 1974 38 p refs
(Contract DNA001-74-C-0014)
(AD-A003475) Avail: NTIS CSCL 07/4

The report contains summaries of ongoing research centering around the area of atmospheric reaction kinetics. Photodetachment, recombination reactions, energy and charge transfer, and gas phase kinetics are some topics included. GRA

N75-26569# Chicago Univ., Ill. Dept. of the Geophysical Sciences.
ON CHAHINE'S RELAXATION METHOD FOR THE RADIATIVE TRANSFER EQUATION
Victor Barcilon Jan. 1975 24 p refs
(Contract N00014-67-A-0285-0021; NR Proj. 041-476)
(AD-A003596; TR-2) Avail: NTIS CSCL 04/1

The iteration scheme proposed by Chahine (1968, 1970, 1972, 1974) for the solution of the radiative transfer equation is discussed in the context of the inverse problem for the thermal structure of the atmosphere. Sufficient conditions which insure the convergence of the iteration are given. GRA

N75-26570# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
MICROTHESAURUS OF SOIL MECHANICS TERMS
Apr. 1974 356 p
(DA Proj. 1E8-65803-M-728; DA Proj. 2P8-65803-M-728)
(AD-A003812) Avail: NTIS CSCL 08/13

This microthesaurus lists in depth over 4000 terms in the subject fields of soil mechanics, soil dynamics, rock mechanics, engineering geology, and pavements, arranged in the format prescribed by Committee on Scientific and Technical Information, Federal Council for Science and Technology, displaying the hierarchical relationships among the terms. GRA

N75-26571# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
REGIONALIZATION OF THE ARCTIC REGION, SIBERIA, AND EURASIAN CONTINENTAL AREA Semiannual Technical Report, Jan. - Jun. 1974
Leon Knopoff Sep. 1974 60 p refs
(Contract F44620-73-C-0048; ARPA Order 1827)
(AD-A004173; AFOSR-75-0083TR) Avail: NTIS CSCL 08/11

The purpose of the regionalization of the Arctic region, Siberia and the Eurasian continental area is to determine the structural properties of the upper few hundred kilometers of the earth, and to determine the variation of these properties from one sub-region to another in the area under investigation. The first technical problem dealt with was the computation of experimental phase velocity curves for surface waves traversing all regions under investigation. The author is now engaged in operation of the complete set of these 44 fundamental Rayleigh wave dispersion curves. The interpretation of these data will give the regionalization of the area. GRA

N75-26572# National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Collision Processes Lab.
REACTIONS OF POSITIVE IONS AND NEGATIVE IONS WITH NEUTRAL SPECIES Final Report, 1 Jul. 1973 - 30 Jun. 1974
E. E. Ferguson, A. L. Schmeltekopf, F. C. Fehsenfeld, D. L. Albritton, and C. J. Howard 25 Nov. 1974 7 p
(DNA Proj. NWED-QAXH)
(AD-A003485; DNA-3428F) Avail: NTIS CSCL 04/1

The flowing afterglow technique for ion-molecule reaction studies developed at NOAA with DNA support has been extended to allow measurement at temperatures up to 900K and relative kinetic energies up to several electron volts. A number of important ionospheric reactions have been measured using these techniques, including most of the important E- and F-region binary positive ion reactions. The NOAA D-region negative ion reaction scheme has been extended to include more effects of hydration and reactions of trace constituents. The reaction NO(+) - H2O - OH to H3O(+) + NO2 has been found to be too slow to be of much D-region significance. Measurements of the charge-transfer of electronically excited O2(+) with N2, have been carried out as a function of energy. GRA

N75-26573# Alaska Univ., College. Geophysical Inst.
SUMMER GLOBAL RADIATION AND ALBEDO: DATA FOR THREE STATIONS IN THE ARCTIC BASIN; ICE ISLAND T-3, BARROW, PRUDHOE BAY, 1971 - 1973
Gunter Weller and Bjorn Holmgren Dec. 1974 41 p
(Contracts N00014-71-A-0364-0001; N00014-67-A-0317-0010; Grant NSF GV-29342)
(AD-A003932; UAG-R-229) Avail: NTIS CSCL 04/1

Daily means of the solar global radiation and the albedo are listed for the months of May to October for three stations in the Arctic Basin, namely Ice Island T-3, Barrow and Prudhoe Bay. The data are for the years 1971-1973. GRA

N75-26574# Aerospace Corp., El Segundo, Calif.
HETEROGENEOUS REACTIONS OF NOx IN THE STRATOSPHERE Interim Report
Henry S. Judeikis 17 Dec. 1974 35 p refs
(Contract F04701-74-C-0075)
(AD-A004070; TR-0075(9270-01)-4; SAMSO-TR-74-268) Avail: NTIS CSCL 04/1

The potential role of heterogeneous reactions of oxides of nitrogen on the NOx (NO + NO2) balance in the stratosphere is examined. Particle concentrations in the upper atmosphere and laboratory data on heterogeneous reactions of NOx are used to estimate the magnitude of these reactions in ambient and perturbed stratospheres. Comparison of the projected heterogeneous rates with those for gas-phase reactions considered to be important suggests that the heterogeneous processes may compete with homogeneous processes for removal or chemical alteration of NOx in a stratosphere perturbed by a major volcanic eruption or a fleet of supersonic transports. The estimated lifetimes for heterogeneous removal of NOx in the latter environment compare favorably with those estimated for trace constituents in the upper atmosphere. These results suggest the importance of heterogeneous processes as one possible sink for NOx in the stratosphere. GRA

N75-26575# Colorado State Univ., Fort Collins. Coll. of Forestry and Natural Resources.
A STOCHASTIC CANOPY MODEL OF DIURNAL REFLECTANCE Final Report, Jul. 1973 - Jun. 1974
Robert E. Oliver and James A. Smith Aug. 1974 121 p refs
(Grant DAHC04-74-G-0001)
(AD-A004026; ARO-9928.4-EN) Avail: NTIS CSCL 17/8

The spectral signature of most vegetation varies with both direction of view and time of day. This variation is spectrally dependent and is due primarily to differences in canopy geometry. As a means of investigating the interaction of shortwave radiation with vegetation a stochastic canopy model was developed. The model uses random variables based on measured distributions for incoming radiation flux, intrinsic optikal properties, and canopy geometry. GRA

N75-26576# Michigan Univ., Ann Arbor. Inst. of Science and Technology.
INSTALLATION OF A HIGH GAIN LONG PERIOD SEISMOGRAPH STATION
F. J. Mauk and James T. Mauk 30 Sep. 1974 34 p
(Contract F44620-73-C-0060; ARPA Order 1827)
(AD-A004137; AFOSR-75-0071TR) Avail: NTIS CSCL 08/11

High gain long period horizontal seismics systems were added to the white Pine seismological observatory which proved to be extremely stable for long term recording. The high gain vertical seismic system was switched from phototube amplified to solid state Geotech AS-650 amplified, along with FM telemetry capability this permitted recording of the HGLP vertical velocity signal at the surface. The vertical velocity output amplified with the Geotech 5240-A phototube amplifier was compared with simultaneously recorded vertical velocity output amplified with the Geotech AS-650 solid state amplifier. It is shown that the phototube amplifiers are substantial noise generating mechanisms and obscure body wave phase arrivals which the AS-650 did not. The output of the AS-650 was a substantial improvement over the 5240-A output. GRA

N75-26577# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN N-LEVEL QUASI-GEOSTROPHIC MODEL SUITABLE FOR OPERATIONAL USE Environmental Research Papers
Samuel Y. K. Yee 22 Oct. 1974 31 p refs
(AF Proj. 8604)
(AD-A003663; AFCRL-ERP-491; AFCRL-TR-74-0525) Avail: NTIS CSCL 04/2

A quasi-geostrophic model has been formulated using the potential vorticity as the only time dependent model variable. The model consists of a two-dimensional prognostic equation of the hyperbolic-type and a three-dimensional diagnostic equation of the elliptic-type. This formulation permits the model equations to be solved more efficiently and perhaps also more accurately than any other formulation that has been in operational use. Preliminary numerical tests using observed data, in connection with comparison case studies of the effect of discretization error and the influence of the lower boundary conditions, indicate that the model is realistic enough to warrant further tests for possible operational use. GRA

N75-26578# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AUTOMATIC PROCESSING OF DIGITAL IONOGRAMS Environmental Research Papers
Raymond J. Cormier and Kenneth Dieter 7 Oct. 1974 23 p refs
(AF Proj. 5631)
(AD-A003639; AFCRL-ERP-489; AFCRL-TR-74-0502) Avail: NTIS CSCL 04/1

The automatic processing of ionograms from raw data (as collected by a digital ionospheric sounder) to electron density profiles has been successfully demonstrated using both daytime and nighttime records. The program is not limited to the production of electron density profiles; it is flexible and has the following options: (1) A filtered ionogram output, where the unwanted noise is eliminated and only the wanted signal remains; (2) A

tabulation of ionospheric parameters such as critical frequencies, virtual heights, and the MUF 3000; (3) A tabulation of hf points for recreating an ionogram; (4) A tabulated output of true height vs electron density. GRA

N75-26579# Texas Instruments, Inc., Dallas. Equipment Group.
VELA NETWORK EVALUATION AND AUTOMATIC PROCESSING RESEARCH Quarterly Report, 1 May - 31 Jul. 1974
Terence W. Harley 15 Aug. 1974 17 p refs
(Contract F08606-74-C-0033; ARPA Order 2551)
(AD-A003507; TI-ALEX(01)-QR-74-03; QR-3) Avail: NTIS CSCL 17/10

The report summarizes progress made during the quarter from 1 May 1974 to 31 July 1974 on the VELA Network Evaluation and Automatic Processing Research program. The six tasks of the program are: Evaluation of the Very Long Period Experiment (VLPE) stations; Investigation of the detection and discrimination characteristics of a seismic network using VLPE, NORSAR, and ALPA data; Investigation of signal detection techniques; Investigation of signal estimation techniques; Investigation of discrimination techniques using first-zone data; and, Simulation of a seismic surveillance system consisting of a network of seismic stations. GRA

N75-26580# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
DIGITAL FEEDBACK SEISMOMETER STUDY Final Report, Oct. 1973 - Jul. 1974
David Gootkind, John R. Howatt, and George J. Burkow Sep. 1974 71 p refs
(Contract F08606-74-C-0029; ARPA Order 2551)
(AD-A003508; R-845) Avail: NTIS CSCL 08/11

Several methods are examined for obtaining digitized output data from the Geotech 36000 horizontal sensing seismometer in borehole installations. Configurations using either ternary or binary pulse width modulated torque-to-balance loops were found to be unsatisfactory. Analog-to-digital conversion of the output signal down-hole was found to be acceptable and a system using a digitizer within the seismometer feedback loop is recommended. GRA

N75-26581# Air Force Academy, Colo. Frank J. Seiler Research Lab.
A STUDY OF AIRBORNE GRAVIMETRY USING REPEATED FLIGHT PATHS Final Scientific Report, Jun. 1970 - Jul. 1974
Gary C. Comfort Aug. 1974 33 p refs
(AF Proj. 7904)
(AD-A003498; SRL-TR-74-0014) Avail: NTIS CSCL 08/14

The report investigates the use of an airborne gravimeter to detect and measure localized, high frequency gravity anomalies. In particular, the effectiveness of employing repeated flights over a region of interest to reduce errors in gravity anomaly determination is investigated. Computer simulations, including gravity modeling and aircraft motion modeling, are used to draw the primary conclusions. GRA

N75-26582# Ohio State Univ., Columbus. Dept. of Geodetic Science.
NON-GLOBAL RECOVERY OF GRAVITY ANOMALIES FROM A COMBINATION OF TERRESTRIAL AND SATELLITE ALTIMETRY DATA
S. Gopalapillai Jul. 1974 108 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-A003686; AFCRL-TR-74-0333; SR-16) Avail: NTIS CSCL 08/5

Two methods for recovery of gravity anomalies are described. Of those, the indirect method, based on the use of the Stokes' formula is chosen for its flexibility in combining any a priori information available on the anomalies and in filtering out any systematic error that may be inherent in the observations. GRA

N75-26583# Texas Instruments, Inc., Dallas. Equipment Group.
VELA NETWORK EVALUATION AND AUTOMATIC PROCESSING RESEARCH Quarterly Report, 1 Aug. - 31 Oct. 1974
William H. Swindell 15 Nov. 1974 14 p
(Contract F08606-74-C-0033; ARPA Order 2551)
(AD-A003676; TI-ALEX(01)-QR-74-04; QR-4) Avail: NTIS CSCL 17/10

The report summarizes progress made during the quarter from 1 August 1974 to 31 October 1974 on the VELA Network Evaluation and Automatic Processing Research program. The six tasks of the program are: Evaluation of the Very Long Period Experiment (VLPE) stations; Investigation of the detection and discrimination characteristics of a seismic network using VLPE, NOSAR, and ALPA data; Investigation of signal detection techniques; Investigation of signal estimation techniques; Investigation of discrimination techniques using first-zone data; and, Simulation of a seismic surveillance system consisting of a network of seismic stations. GRA

N75-26584# Analysis and Computer Systems, Inc., Burlington, Mass.
DATA ANALYSIS AND PROCESSING TECHNIQUES APPLIED TO ROCKET BORNE EXPERIMENTS Final Report, 1 Apr. 1973 - 31 Mar. 1974
James R. Delaney Jun. 1974 59 p
(Contract F19628-73-C-0121)
(AD-A004128; AFCRL-TR-74-0505) Avail: NTIS CSCL 04/1

This report discusses the data analysis and processing techniques applied to telemetry data from rocket borne transducer experiments. The data formats processed, the reduction techniques applied and the mathematical formulas used for specific experiments are detailed. The computer programs developed, as an integral part of the processing system, for use in many applications are presented and discussed. GRA

N75-26585# Georgetown Univ., Washington, D.C. Dept. of Physics.
SCALE MODEL ULTRASONIC STUDY OF ARCTIC ICE Final Technical Report, 1 Oct. 1972 - 15 Jan. 1975
Walter G. Mayer 24 Jan. 1975 9 p refs
(Contract N00014-69-A-0220-0007; NR Proj. 307-352)
(AD-A004249; GUUS-01751) Avail: NTIS CSCL 08/12

The work sponsored by this Contract was concerned with a scale-model study of sonic reflectivity, transmissivity and the partition of energy upon sonic incidence at the Arctic Ice cover. The basic experimentation was accomplished by using megahertz ultrasonic signals and allowing them to impinge, in a controlled manner, on various liquid/solid boundaries, simulating as much as feasible the actual situation which is found in the Arctic. From the results of the measurements of reflectivity and mode conversions on scale-model samples, a number of properties of both the liquid and the solid were deduced. GRA

N75-26586# Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
INTEGRATED GEOPHYSICAL AND GEOLOGICAL STUDY OF EARTHQUAKES IN NORMALLY ASEISMIC AREAS Semiannual Technical Report, 1 Mar. - 30 Sep. 1974
Jack E. Oliver and Bryan L. Isacks Sep. 1974 47 p refs
(Grant AF-AFOSR-2494-73; ARPA Order 1827)
(AD-A004472; AFOSR-75-0084TR) Avail: NTIS CSCL 08/11

A compilation of known occurrences of post-Cretaceous faulting in eastern North America was compiled and a bibliography of papers related to the geology, seismicity, tectonics and recent crustal movements of China was prepared from various international journals. Two maps of the seismicity of eastern North America are presented. GRA

N75-26587# Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
SOME NOTES ON LONG-PERIOD SIGNALS Quarterly Report, 1 Jul. - 30 Sep. 1974
Roy Greenfield Nov. 1974 49 p refs
(Contract F44620-74-C-0066; ARPA Order 1827)
(AD-A004825; OAS-TR-74-252; AFOSR-75-0189TR) Avail: NTIS CSCL 17/10

The problem investigated was the one of long-period signals (30-60 seconds) from a single three-component seismometer to determine the Love and Rayleigh components of an explosive event in the presence of noise or an interfering earthquake. A review of current knowledge concerning long-period noise

characteristics and interfering earthquake signals is made. In addition, a review of work concerning experimental studies of ellipticity is made. GRA

N75-26588# Hawaii Inst. of Geophysics, Honolulu.
RAYLEIGH WAVES FROM HIGH GAIN LONG-PERIOD STATIONS, SIGNAL EXTRACTION AMPLITUDE DETERMINATION AND SEPARATION OF OVERLAPPING WAVE TRAINS Interim Report
Eduard Berg Sep. 1974 55 p refs
(Grant AF-AFOSR-2612-74; ARPA Order 1827)
(AD-A004486; HIG-74-10; AFOSR-75-0207TR) Avail: NTIS CSCL 17/10

Rayleigh waves are extracted and amplitudes (with standard errors) and origin time (within a few seconds) determined by use of reference earthquakes or explosions, high pass (HP) and normalized matched (NM) (or correlation) filters, and the oceanic group-velocity dispersion between 38 and 18 seconds. For a signal-to-noise ratio between 0.2 and 0.1 on the original single-component records, amplitudes for Rayleigh waves over oceanic paths of 155 degrees at station MAT and 98 degrees at station KIP have been determined as 12 m(mu) (10 digital units) and 24 m(mu) (25 digital units) peak-to-peak (p-p), respectively, with a standard error of less than 11%. In each case the processed signal is the highest in a half-hour processed record. The method also provides high resolution of co-located events with short time separation, or widely spaced events with Rayleigh waves arriving nearly simultaneously at a single station. GRA

N75-26589# Aerospace Corp., El Segundo, Calif. Lab. Operations.
MONOCHROMATIC TRANSMITTANCE/RADIANCE COMPUTATIONS Interim Report
Charles M. Randall 31 Dec. 1974 86 p refs
(Contract F04701-74-C-0075; ARPA Order 2843)
(AD-A003755; TR-0075(5647)-3; SAMSO-TR-74-247) Avail: NTIS CSCL 04/1

A computer program and associated procedures have been developed to compute high resolution spectra for inhomogeneous optical paths including both atmospheric conditions and conditions typical of a missile plume. These programs and procedures are outlined in this report. The procedures have been used with the Air Force Cambridge Research Laboratories line atlas to demonstrate that ignoring the correlation of atmospheric absorption lines with source emission lines can lead to errors as high as 79 percent for some spectral bands and optical paths. Calculated spectra have been compared with experimental laboratory spectra typical of both atmospheric and missile plume conditions. The AFCRL line atlas requires the addition of lines from highly excited states and the correction of certain inadvertent errors to be applicable to the calculation of high temperature optical properties of gases. GRA

N75-26590# Naval Research Lab., Washington, D.C.
A CONTINUOUS SLOWING DOWN ELECTRON ENERGY DEPOSITION MODEL
P. S. Julienne Dec. 1974 20 p refs
(NRL Proj. H02-35; DNA Proj. NWET-HX63306)
(AD-A003459; NRL-MR-2958) Avail: NTIS CSCL 04/1

A simple continuous-slowing-down model of the altitude dependent energy deposition of energetic auroral electrons is described. The computer code uses experimental cross sections in numerical form where they are available, and predicts the volume production rates of the various excitation, ionization, and dissociation processes for the atmospheric species N2, O2, and O. Some sample results for the low energy electron flux and for the total energy deposition rate are shown and compared to the predictions of other codes. GRA

N75-26591# Naval Research Lab., Washington, D.C.
NUMERICAL STUDIES OF TYPE 2 EQUATORIAL ELECTROJET IRREGULARITY DEVELOPMENT
B. E. McDonald, T. P. Coffey, S. L. Ossakow, and R. N. Sudan Dec. 1974 28 p refs
(NRL Proj. A03-16; RR0330242)
(AD-A003461; NRL-MR-2961) Avail: NTIS CSCL 04/1

A computer simulation based on fluid equations of motion seems to account for basic observational features of short wavelength type 2 (subsonically propagating) ionization irregularities in the equatorial electrojet. The short wavelengths (less than 28 meters for parameters taken here) are excited only after long wavelengths, horizontally propagating waves grow to an amplitude sufficient to trigger the nonlinear growth of secondary vertically propagating modes. The result is a complicated two dimensional turbulent flow, with convective elements moving with comparable vertical and horizontal velocities. The density fluctuation power spectrum obeys approximately a power law k to the minus 3.5 power. These results agree with theory and observation. GRA

N75-26592# Naval Research Lab., Washington, D.C.
IONOSPHERIC CONDUCTANCE FOR SUB-AURORAL LATITUDES AT EQUINOX TWILIGHT
J. A. Fedder and S. L. Ossakow Nov. 1974 17 p refs
(NRL Proj. 77H02-27D)
(AD-A003462; NRL-MR-2933) Avail: NTIS CSCL 04/1

In this note, ionospheric conductivities for electric currents perpendicular to the geomagnetic field are presented. The conductivities have been computed for sub-auroral latitudes for spring and autumn twilight conditions to aid in planning and simulation of the Defense Nuclear Agency-sponsored 1975 barium cloud releases in Alaska. GRA

N75-26593# Naval Research Lab., Washington, D.C.
PRELIMINARY REPORT ON A PROGRAM TO STUDY PROTON DEPOSITION IN THE ATMOSPHERE
J. E. Rogerson and J. Davis Dec. 1974 23 p refs
(NRL Proj. H02-35)
(AD-A003463; NRL-MR-2967) Avail: NTIS CSCL 04/1

A one-dimensional model based on a continuous slowing down approximation is used to study proton deposition in the atmosphere. The effects of hydrogen atoms created by charge exchange processes with atmospheric gases are included, and secondary electron processes are taken into account. Some preliminary results are presented for several incident-proton energies. GRA

N75-26594# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
PHYSICS AND CHEMISTRY OF ATMOSPHERES Final Report, May - Dec. 1974
Billy M. McCormac Dec. 1974 49 p refs Presented at the Summer Advanced Study Inst., Liege, 29 Jul. - 9 Aug. 1974
(Contract N00014-74-C-0356)
(AD-A003600; LMSC-D407479) Avail: NTIS CSCL 04/1

The presentations and discussions of the Summer Advanced Study Institute, Physics and Chemistry of Atmospheres, held at the University of Liege, Liege, Belgium, July 29-August 9, 1974, are summarized. Subject areas include: physical processes, structure and composition of the atmosphere, laboratory measurements of relevant rate coefficients, atmospheric and ionospheric models, optical observations, and atmospheres of other planets. GRA

N75-26595# Transportation Systems Center, Cambridge, Mass.
PROCEEDINGS OF THE THIRD CONFERENCE ON THE CLIMATIC IMPACT ASSESSMENT PROGRAM
Anthony J. Broderick and Thomas M. Hard Nov. 1974 668 p refs Conference held at Cambridge, Mass., 26 Feb. - 1 Mar. 1974
(Contract DOT-PPA-OS-520)
(AD-A003846; TSC-OST-74-15) Avail: NTIS CSCL 04/1

This volume contains the proceedings of the Third Conference on the Climatic Impact Assessment Program (CIAP), held at the DOT Transportation Systems Center from February 26 to March 1, 1972. It includes 45 invited papers, 20 unscheduled presentations, and edited question-and-answer sessions following some of the papers. The conference was essentially a progress report on CIAP. Therefore, some of the papers contain new data not yet published elsewhere, and others describe experimental equipment. Reports on work relevant to CIAP, though not sponsored by it, are also included. The subjects covered include aircraft-engine emissions, the nature of the undisturbed stratosphere of 1974, the nature of the perturbed stratosphere of

1990-2025, the possible resulting tropospheric perturbations, and the biological and economic effects of such perturbations. GRA

N75-26596# Systems Science and Software, La Jolla, Calif.
APPLICATIONS OF ADVANCED METHODS FOR IDENTIFICATION AND DETECTION OF NUCLEAR EXPLOSIONS FROM THE ASIAN CONTINENT Semiannual Report
T. C. Bache, J. T. Cherry, and J. M. Savino Oct. 1974 140 p refs
(Contract F44620-74-C-0063; ARPA Order 1827)
(AD-A004479; SSS-R-75-2483; AFOSR-75-0206TR) Avail: NTIS CSCL 17/10

The report presents the results of a continuing effort to obtain an optimum multi-discriminant/detection procedure for earthquakes and explosions occurring within the Asian Continent. Significant improvement of theoretical predictions of teleseismic ground motion from explosions was realized using a deterministic computer model which merges nonlinear shock code calculations with far-field stress wave propagation through a realistic earth structure. The addition to the seismic codes of the Thomson-Haskell matrix formulation and a split earth structure capability provides for the inclusion of more realistic earth structure models in the near source and receiver regions and for the intervening path in the upper mantle. The resulting theoretical seismograms show a striking similarity to observations and indicate that a successful matched filter for event detection and discrimination, based on a substantial portion of an event signal, can be constructed. GRA

N75-26597# Texas Instruments, Inc., Dallas. Equipment Group.
COUNTEREVASION STUDIES, PART B Semiannual Technical Report, 1 May - 31 Oct. 1974
Stephen S. Lane and David Sun 30 Nov. 1974 34 p refs
(Contract F44620-73-C-0055; ARPA Order 1827)
(AD-A004820; TI-ALEX(02)-TR-74-03-Pt-B; AFOSR-75-0181TR; SATR-3) Avail: NTIS CSCL 17/10

In Semi-Annual Technical Report No. 2 - Part B, a detailed description of the complex cepstrum was given, and the effect of exponentially weighting the input trace was discussed from a theoretical point of view. The limit of the cepstrum technique as applied to synthetic mixtures of underground nuclear explosions was found to be about 0.5 seconds, and an example of a presumed multiple underground nuclear explosion was analyzed. The purpose of the present report is to develop a more effective form of comb filter for the cepstrum, and to investigate the limit to which the depth phase from underground nuclear explosions can be resolved. A matched waveform filter has been developed to aid in the solution of these problems. Subsection B discusses the theoretical basis for the comb and matched waveform filters. Subsection C is concerned with synthetic mixtures of direct and depth phases from presumed underground nuclear explosions. GRA

N75-26598# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
FUNDAMENTAL MECHANISMS IN THE POLAR CAP REGION Final Report, 2 Nov. 1971 - 30 Jun. 1974
Alex E. S. Green 21 Oct. 1974 118 p refs
(Contract F19628-72-C-0122; AF Proj. 7661)
(AD-A003692; AFCRL-TR-74-0241) Avail: NTIS CSCL 04/1

A detailed atomic cross section (DACS) approach has been developed and applied to the problem of proton energy deposition in the polar cap atmosphere. Using the systematics of empirical data, expressed by simple analytic forms, in conjunction with the Born-Bethe approximation to relate proton and electron impact cross sections at high energies, a set DACS for proton and hydrogen atom impact excitation of N2, O2 and O has been assembled. Volume ionization and volume excitation rate profiles necessary for the calculation of spectral emission intensities have been obtained for arbitrary incident proton spectra. Physicochemical processes have been modeled to obtain these contributions to the spectral intensities of low-lying atomic oxygen states. A Monte Carlo method, which allows simulation of the stochastic walk in both energy and position has been developed for application to polar cap processes. GRA

N75-26450 Joint Publications Research Service, Arlington, Va.
THEORY OF HYDROMORPHOLOGICAL RELATIONS FOR STABLE CHANNELS
G. T. Tagaymuradov and Yu. V. Chernov *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 108-118 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 85-92 (For availability see N75-26441 17-42)

N75-26454 Joint Publications Research Service, Arlington, Va.
NEW METHOD OF OBSERVING ICE PHENOMENA ON THE RIVERS AND RESERVOIRS
B. M. Ginzburg, Yu. V. Nalimov, and M. B. Ponomarev *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 151-153 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 114-115 (For availability see N75-26441 17-42)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-26593# Cardion Electronics, Woodbury, N.Y.
DIGITAL WEATHER DISPLAY PANEL SYSTEM Final Report, Jun. 1972 - Apr. 1974
James Rudd and Reise Jacobs Apr. 1974 153 p refs
(Contract DOT-FA7WA-2935)
(AD-A006998; FAA-RD-74-101) Avail: NTIS HC $6.25 CSCL 14/2

The design effort is described along with a description of the equipment items developed to receive data from the AMOS-III-70. The developed equipment consists of a signal conditioning unit, a manual input controller, and two digital weather display panels. The signal conditioning unit receives weather data from the AMOS-III-70 or from the manual input controller and displays the data and time of day information on the remote digital weather display panels. Author

N75-26600# Materials Research Labs., Maribyrnong (Australia).
HIGH TEMPERATURES IN AUSTRALIA
Maureen E. Redman and J. A. McRae Apr. 1975 17 p refs
(Rept-625) Avail: NTIS HC $3.25

A large body of three-hourly meteorological readings was analyzed to define the occurrence of high temperatures throughout mainland Australia. The hotter areas of the continent were defined in terms of the temperatures exceeded for 1 percent of the hottest months, and the probabilities of encountering different periods of given temperatures were obtained. Author

N75-26601# Weapons Research Establishment, Salisbury (Australia).
MEASUREMENTS OF THE BASIC ATMOSPHERIC PARAMETERS AT WOOMERA USING THE FALLING SPHERE JANUARY TO MAY 1974
P. H. O. Pearson Feb. 1975 46 p refs
(WRE-TN-1331(WR/D)) Avail: NTIS HC $3.75

Falling sphere experiments were conducted on a monthly basis at approximately 6 deg solar depression in the evening about 30 minutes after sunset and close to local midday. The results are presented for density, temperature, pressure and wind. These results are discussed and a comparison made with other data obtained in previous years. Author

N75-26602# Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
GTWS: GEORGIA TECH WATERSHED SIMULATION MODEL. PART 1: THE MODEL. PART 2: PARAMETER OPTIMIZATION. PART 3: MODEL STUDIES
Alan M. Lumb, Leslie F. Currie, Timothy D. Hassett, and John Zorich Jan. 1975 239 p refs
(Contract DI-14-31-0001-4010)
(PB-239937/6; ERC-0175-Pt-1; ERC-0175-Pt-2; ERC-0175-Pt-3; OWRTA-047-GA(1)-Pt-1; OWRT-A-047-GA(1)-Pt-2; OWRT-A-047-GA(1)-Pt-3) Avail:

NTIS MF $7.50 CSCL 08H

The watershed simulation model provides a continuous deterministic simulation of streamflow precipitation data. The total program contains two options: (1) direct use of the Stanford watershed model, and (2) use of supplemental features representing additional storages and processes. Detailed documentation of the equations and listings of the program and the input data are provided. Required input to the model includes values for parameters representing watershed characteristics, and precipitation and evaporation amounts by time increments chosen for the simulation. Streamflow data can be entered in order to print or plot comparisons between simulated and recorded flows. GRA

N75-26603# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Aug. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, AOUT 1974]
Aug. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during August 1974 are given. The parameters studied include atmospheric pressure, storms, humidity, and precipitation. ESRO

N75-26604# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
WSMR CLIMATE CALENDAR
David J. Novlan Jan. 1975 28 p
(DA Proj. 1T6-65702-D-127)
(AD-A008016; DR-876) Avail: NTIS CSCL 04/2

The report is the sixth edition of the White Sands Missile Range Climate Calendar, which was first published in May 1963. Mean daily maximum and minimum temperatures, and extreme temperatures for the period of record (1950-1974) are tabulated in calendar form for A Station, the forecast center located at Headquarters, White Sands Missile Range, New Mexico. Averages of temperature, relative humidity, wind and cloudiness are included for each month, as well as maximum 24-hour and monthly rainfall. Supplementary tables give monthly, seasonal and annual values of maximum winds, degree days, solar radiation, means and extremes of station pressure, the greatest monthly and single-storm snowfall, and the average six-hourly relative humidities. Also included are the average number of days with the occurrence of precipitation, distant lightning, thunderstorms, and visibility restrictions. GRA

N75-26605# Naval Postgraduate School, Monterey, Calif.
THE RELATIONSHIP OF TEMPERATURE INVERSIONS TO MARINE ADVECTION FOG M.S. Thesis
Robert Jerome McClure Sep. 1974 90 p refs
(AD-A003864; NPS-51MC74091) Avail: NTIS CSCL 04/2

The purpose of this study was to search for a consistent link between temperature inversions and the occurrence of marine advection fog, in order that the temperature inversions could possibly be used as a forecasting aid at coastal stations. A data base of 10 months, July 1973 to April 1974, was used in the study, covering the summer, fall, and winter seasons. The inversion parameters investigated were the height of the inversion base, thickness of the inversion layer and the temperature gradient within the inversion layer. A relationship between the change in inversion parameters and the occurrence of fog was found to exist at San Diego, California, in the summer and winter seasons. At Oakland, California, consistency in the change of at least one parameter was found in the summer and fall seasons, and the first two months of the winter season. GRA

N75-26606# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF THE HARBORS OF SUBIC BAY AND MANILA, REPUBLIC OF THE PHILIPPINES, AS TYPHOON HAVENS M.S. Thesis
John Allen Douglass Sep. 1974 112 p refs
(AD-A003784) Avail: NTIS CSCL 04/2

The study evaluates the harbors of Subic Bay and Manila as possible typhoon havens. Characteristics of the harbors under tropical cyclone conditions, including climatology, topographical effects on the wind, and reliability of moorings and anchorages at each harbor are discussed. Problem areas to be considered if remaining in port and suggested evasion procedures for ships sailing from the port are examined. The tracks of tropical cyclones from 1884-1973 for the western North Pacific were analyzed to assess the threat posed to each harbor by a tropical cyclone. Results suggest that neither port is an entirely safe haven. Subic Bay could be a haven under certain specified conditions while Manila should never be considered a typhoon haven. GRA

N75-26607# Naval Postgraduate School, Monterey, Calif.
OCEAN THERMAL STRUCTURE RESPONSE TO A MOVING HURRICANE MODEL M.S. Thesis
Robert Norris Trapnell, Jr. Sep. 1974 52 p refs
(AD-A003519) Avail: NTIS CSCL 04/2

The time-dependent mixed-layer depth and temperature response of a two-layer ocean model to a moving hurricane model was investigated. The hurricane model was that of Elsberry, Pearson, and Corgnati (1974). The maximum hurricane wind was bounded at 50 m/sec in order to isolate ocean reactions from hurricane variance. The ocean model was based on that of Fraim (1973) which was derived from the earlier mixed-layer models of Kraus and Turner (1967) and Denman (1973). The ocean model was an idealized, quasi-three-dimensional model designed to examine the effects along the path of movement due to the passage of a moving hurricane. GRA

N75-26608# McGill Radar Weather Observatory, Ste. Anne de Bellevue (Quebec).
MEASUREMENT AND APPLICATION OF RAINFALL AUTOCORRELATION FUNCTIONS
Isztar Zawadski Jan. 1973 42 p refs
(Contract F19628-73-C-0052; AF Proj. 6672)
(AD-A004132; MW-76; AFCRL-TR-73-0318; SR-2) Avail: NTIS CSCL 04/2

Space and time autocorrelation functions are defined for the precipitation process on a horizontal plane. An optical device was designed and used to measure these functions as well as the mean, the mean square and the variance of the rainfall rate for a time sequence of precipitation patterns of a widespread convective storm. The input data were radar PPI records stored on film in which the transmittance was adjusted to be proportional to rainfall rate. GRA

N75-26609# Army Electronics Command, Fort Monmouth, N.J.
A TRANSIT-TIME LIDAR WIND MEASUREMENT: A FEASIBILITY STUDY
T. L. Barber and J. B. Mason Dec. 1974 19 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-A003995; ECOM-5550) Avail: NTIS CSCL 04/2

Transit-time lidar is being used experimentally by the Army for remote wind measurement. The system developed at White Sands Missile Range uses lidar backscatter from patterns of irregularities in atmospheric dust concentration to measure the component of the wind normal to the laser beam. The system is described, and experimental data on wind measurements from 2 to 15 m/sec at a range of 250 m are presented. GRA

N75-26610# Environmental Technical Applications Center (Air Force), Washington, D.C.
ESTIMATED IMPROVEMENT IN FORECASTS OF THE SANBAR HURRICANE MODEL USING THE AIRBORNE WEATHER RECONNAISSANCE SYSTEM (AWRS)
Albert Boehm Jan. 1975 13 p refs
(AD-A004097; USAFETAC-TN-75-1) Avail: NTIS CSCL 04/2

SANBAR is a one level, barotropic model that forecasts hurricane position. Inputs such as storm movement and maximum winds were selectively varied to measure sensitivity to errors. SANBAR is most sensitive to movement error and somewhat sensitive to errors in maximum wind. Movement error depends primarily on the errors in successive storm fixes. Knowing the current aircraft error, forecast error can be split into modeling error and observational error. Using the new Airborne Weather Reconnaissance System observations, the SANBAR 24-hour mean vector error is expected to be 60 NM versus the current 113 NM. GRA

N75-26611# Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
EVAPORATIVE WATER LOSS FROM LARGE LAND AREAS

IN THE FINGER LAKES Technical Report, Jul. 1971 - Jun. 1974
Wilfred H. Brutsaert Sep. 1974 8 p refs
(Contract DI-14-31-0001-3832)
(PB-240170; TR-86) Avail: NTIS HC $3.25 CSCL 04B

A method is presented which was developed to calculate evapotranspiration rate and is based on the theory of turbulent mass transfer in the atmospheric boundary layer, utilizing standard meteorological data. The method was applied to the Finger Lakes Region and results were found to be highly correlated with pan evaporation data at Ithaca, New York. Author

N75-26612# Texas Univ., Austin. Center for Research in Water Resources.
FLOOD FLOW FREQUENCY TECHNIQUES
Leo R. Beard 1 Oct. 1974 224 p
(PB-239951/7; CRWR-119; W7505262; OWRT-C-5340(9088)(1)) Avail: NTIS HC $7.25 CSCL 08H

Through the use of computer analysis, techniques were developed that will yield greater reliability and consistency than has heretofore been available in flood flow frequency determinations from data on natural stream flows available at the location for which each frequency estimate is to be computed. U.S. Geological Survey streamflow stations with records 40 years or longer and unregulated flow were selected and analyzed using Log Pearson III, Log Normal, Gumbel, Log Gumbel, two-parameter gamma, three-parameter gamma, Log Pearson III with regional skew and best Linera Invariant Gumbel distribution techniques. GRA

N75-26613# Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
EFFECT OF METEOROLOGICAL VARIABLES ON TEMPERATURE CHANGES IN FLOWING STREAMS Final Report in Ecological Research Series
Robert W. Troxler, Jr. and Edward L. Thackston Jan. 1975 86 p refs
(Grant EPA-R-800613)
(PB-240285/7; EPA-660/2-75-002) Avail: NTIS HC $4.75 CSCL 08H

A mathematical model for predicting the change in water temperature in a flowing stream as a function of stream geometry and standard weather information was developed and tested. Five field tests were conducted on cold water released from hydro-power stations as it warmed up moving downstream over periods up to 38 hours. GRA

N75-26442 Joint Publications Research Service, Arlington, Va.
CIRCULATION INDEXES FOR DIFFERENT PHASES OF THE QUASIBIANNUAL WIND CYCLE IN THE EQUATORIAL STRATOSPHERE
Kh. P. Pogosyan and A. A. Pavlovskaya *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 23-32 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 19-26 (For availability see N75-26441 17-42)

N75-26443 Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN THE INTERACTION OF THE WEATHER FORECASTER WITH A COMPUTER FOR NUMERICAL FIVE-DAY TOTAL PRECIPITATION FORECASTING
A. L. Kats *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 33-40 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 27-32 (For availability see N75-26441 17-42)

N75-26444 Joint Publications Research Service, Arlington, Va.
DIURNAL VARIATION OF THE METEOROLOGICAL ELEMENTS IN THE STRATOSPHERE
K. T. Logvinov *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 41-53 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 33-42 (For availability see N75-26441 17-42)

N75-26445 Joint Publications Research Service, Arlington, Va.
CALCULATING THE AEROSOL ATTENUATION INDEX
K. A. Tavartkiladze *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 54-61 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 43-49 (For availability see N75-26441 17-42)

N75-26446 Joint Publications Research Service, Arlington, Va.
CALLING ON SATELLITE AND FORECASTING DATA FOR OBJECTIVE ANALYSIS
V. A. Shakhmeyster *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 62-72 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 50-57 (For availability see N75-26441 17-42)

N75-26451 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE AIR HUMIDITY AND TEMPERATURE ON THE TEA LEAF HARVEST IN THE SUBTROPICAL ZONE OF KRASNODAR KRAY
P. M. Bushin *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 119-128 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 93-100 (For availability see N75-26441 17-42)

N75-26452 Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN COMPARING THE SATELLITE AND GROUND CLOUD DATA
A. F. Dyubyuk, V. M. Berezin, T. N. Bibikova, and Ye. V. Zhurba *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 129-135 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 101-104 (For availability see N75-26441 17-42)

N75-26455 Joint Publications Research Service, Arlington, Va.
MACROCIRCULATION METHOD OF LONG-RANGE METEOROLOGICAL FORECASTING
V. I. Vorobyev and I. M. Dolgin *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 158-162 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 118-120 (For availability see N75-26441 17-42)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-26614*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
A THEORY OF WAVE SCATTER FROM AN INHOMOGENEOUS MEDIUM WITH A SLIGHTLY ROUGH BOUNDARY AND ITS APPLICATION TO SEA ICE
S. K. Parashar, A. K. Fung, and R. K. Moore Dec. 1974 22 p refs
(Contract NAS9-10261)
(NASA-CR-141870; RSL-TR-177-53) Avail: NTIS HC $3.25 CSCL 08J

An analytical theory of electromagnetic wave scattering from an inhomogeneous medium with a slightly rough boundary surface is formulated. The inhomogeneity in the medium is assumed to vary continuously in the vertical direction and to have a small random variation in the horizontal direction. The medium is assumed to consist of two layers. Maxwell's equations are solved by using the small perturbation method together with Fourier transform technique. The resulting differential equations are solved by using WKB and variation of parameter methods. Field amplitudes in each medium are determined by taking boundary conditions into account. The expressions for first order polarized radar backscatter cross-section are obtained. An attempt is made to apply the developed theory to compute sea ice scatter. Numerical calculations are performed for polarized radar backscatter cross-section at two frequencies, 13.3 GHz and 400 MHz. It is shown that WKB method is applicable at both of these frequencies. Theoretical results are compared with the experimental results obtained from NASA Earth Resources Program mission 126. Theoretical results and experimental results are in good agreement. Author

N75-26615# Technische Hogeschool, Delft (Netherlands).
OFFSHORE SEDIMENT TRANSPORT AND EQUILIBRIUM BEACH PROFILES Ph.D. Thesis

Dirk Hermanus Swart 18 Dec. 1974 318 p refs
Avail: NTIS HC $9.25

A predictive model, based on both model and prototype data, is developed to enable the computation of the offshore sediment transport on sandy beaches under wave action, as well as of the corresponding time-dependent and eventual equilibrium beach profiles. Author

N75-26616# Delaware Univ., Newark. Coll. of Marine Studies.
RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT Annual Status Report
William S. Gaither and Vytautas Klemas Nov. 1974 45 p refs
(Contract N00014-69-A-0407)
(AD-A003597; TR-32) Avail: NTIS CSCL 08/3

Progress during the fifth year of a multidisciplinary study of coastal processes has been directed toward the development and perfection of a dynamic prediction model with two distinct and mutually complementary approaches. The first is concentrated on the understanding and application of the basic physical mechanism in coastal processes. The second is the realistic definition and prediction of the random aspects of the coastal environment, primarily waves and tides, so that when these random inputs are used together with field measurements by remote sensing and other techniques, the output predictions can be truly realistic and highly reliable. The end product of this research will provide real-time prediction of coastal changes with a minimum of input requirements. The results will be displayed on a screen or quick-copied tactical maps. GRA

N75-26617# Naval Research Lab., Washington, D.C.
DESIGN OF A SHIPBOARD COMPUTER SYSTEM FOR NRL OCEANOGRAPHIC RESEARCH SHIPS Interim Report
Daniel Steiger Dec. 1974 15 p refs
(AD-A003464; NRL-MR-2968) Avail: NTIS CSCL 09/2

A shipboard computer facility to support oceanographic research at NRL has been designed and is currently being developed. This shipboard computer system consists of dual, identical minicomputers; one computer is used for the real-time acquisition of oceanographic data and navigation, and the second computer is used for data processing, general purpose computing, and spectrum analysis using a hardware fast Fourier analyzer. Program and data storage on each computer is accomplished by a random access disc and dual magnetic tape units. GRA

N75-26618# Lamont-Doherty Geological Observatory, Palisades, N.Y.
OCEAN CURRENT OBSERVATIONS AT THE AIDJEX 1972 MAIN CAMP, 1. THE OCEAN BOUNDARY LAYER AND ICE-WATER STRESS DURING AIDJEX 1972, 2. AN ESTIMATE OF INTERNAL WAVE DRAG ON PACK ICE, 3
Kenneth Hunkins and Myron Fliegel Dec. 1974 68 p refs
(Contract N00014-67-A-0108-0039; NR Proj. 307-359)
(AD-A003956; TR-1) Avail: NTIS CSCL 08/3

Contents: Ocean current observations at the AIDJEX 1972 main camp; The ocean boundary layer and ice-water stress during AIDJEX 1972; and An estimate of internal wave drag on pack ice. GRA

N75-26619# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
THEORETICAL CALCULATIONS OF INTERNAL WAVE DRAG ON SEA ICE
Fred Rigby 1974 15 p refs
(Contract N00014-67-A-0103-0007; NR Proj. 307-252)
(AD-A003614; TR-26) Avail: NTIS CSCL 08/3

Because of the density stratification in the upper part of the Arctic Ocean, the movement of pressure ridge keels through the mixed layer can create internal waves in the vicinity of the pycnocline. These waves transport energy away from the keels and thereby generate drag on the ice. The study defines the conditions under which wave drag could contribute significantly to the total water stress. The development of internal waves downstream from a semielliptical keel is described by a simple two-dimensional, two-layer ocean model. Results calculated from the model show the dependence of wave drag on keel depth, current speed, depth of the upper layer, and density change across the interface between the layers. Comparison of the relative magnitudes of form drag and wave drag suggests that wave drag is not negligible near large keels when the current is flowing strongly. GRA

N75-26620# Texas Univ., Austin. Applied Research Labs.
COMPRESSIONAL WAVE PROFILOMETER FOR DEEP WATER MEASUREMENTS Annual Report, 1 Aug. 1973 - 1 Jul. 1974
Donald J. Shirley and Aubrey L. Anderson 6 Dec. 1974 76 p refs
(Contract N00014-70-A-0166-0017)
(AD-A003910; ARL-TR-74-51) Avail: NTIS CSCL 08/10

Measurements with a prototype model of the compressional wave profilometer have demonstrated the usefulness and accuracy of in situ sound speed data obtained during coring of ocean bottom sediments. Experience gained during measurements with the prototype confirmed the initial assumption that the final version of the instrument should be self-contained with the electronic circuits and a magnetic recorder packaged in a watertight housing which is attached to the corer. This new profilometer configuration has been designed and built. Testing of the profilometer has been accomplished in water depths up to 4.5 km. The new recording and playback circuits are described in detail. Test results are given including the first available high resolution in situ sound speed and attenuation profiles to 12 m depth in deep water sediments. GRA

N75-26621# Naval Postgraduate School, Monterey, Calif.
MASS, SALT, AND HEAT TRANSPORT ACROSS 40 DEGREES N LATITUDE IN THE ATLANTIC OCEAN BASED ON IGY DATA AND DYNAMIC HEIGHT CALCULATIONS M.S. Thesis
Tommy Darell Greeson Sep. 1974 137 p refs
(AD-A003527) Avail: NTIS CSCL 08/3

The study discusses the development of a computer program capable of performing the necessary dynamic computations to obtain estimates of the transports of mass, salt, and heat across the vertical cross section at 40 degrees N within the North Atlantic Ocean. Previous studies have used either different approaches to the problem or, if the same approach was used, then the data were averaged to eliminate seasonal effects. Temperature and salinity data from Crawford Cruise 16, 2 to 22 October 1957 of the International Geophysical Year, are used for the entire cross section of ocean. GRA

N75-26622# Naval Postgraduate School, Monterey, Calif.
THE EFFECTS OF HEAT EXCHANGE AND THERMAL ADVECTION ON THE RATE OF CHANGE OF TEMPERATURE AT OCEAN WEATHER STATION NOVEMBER M.S. Thesis
Larry Martin Thorne Sep. 1974 91 p refs
(AD-A003542) Avail: NTIS CSCL 08/10

The effects of heat exchange across the sea surface and heat advection on the observed rate of change of temperature were examined using a physical cause-effect principle. Parameters that are easily calculated from routine meteorological and oceanographic observations at Ocean Weather Station NOVEMBER during 1954 through 1970 were used. A three-dimensional plot of the annual variations of the monthly means of observed rate of change of temperature produced three distinct trends. Heat exchange primarily contributed to the modification of the observed rate of change of temperature during the first two trends while a combination of both physical processes affected the observed rate of change of temperature in the third trend. Over short periods of time (month to month) anomalous SST changes appear to be established primarily by the advection pattern. GRA

N75-26623# Naval Postgraduate School, Monterey, Calif.
MEASUREMENT AND ANALYSIS OF TEMPORAL VARIATIONS OF SALINITY IN SHALLOW WATER M.S. Thesis
Leonard K. Kane, II Sep. 1974 81 p refs
(AD-A003536) Avail: NTIS CSCL 08/10

A four electrode conductivity instrument was developed to determine variations of conductivity in an ocean environment at a fixed point. A field experiment was conducted in Mission

Bay, San Diego, California. Results indicate that the instrument functioned properly and accurately determined conductivity microstructure. From conductivity and associated temperature data, salinity data was derived which portrays a well mixed salinity structure. Difficulty with a mismatch of time constants between conductivity and temperature instruments prevented the accurate determination of salinity microstructure although there was evidence that one existed. GRA

N75-26624# Naval Postgraduate School, Monterey, Calif.
AN OCEANOGRAPHIC INVESTIGATION OF MESOSTRUCTURE NEAR ARCTIC ICE MARGINS M.S. Thesis
William Russell Corse Sep. 1974 53 p refs
(AD-A003545) Avail: NTIS CSCL 08/10

The origin and continuity of complex temperature profiles observed in the Chukchi Sea as part of the MIZPAC 71 program was investigated. The positive temperature anomalies, termed mesostructure elements were found to have their heat source in the warm coastal current. Interleaving coupled with mixing in the marginal ice zone due to ice protuberances was found to account for the temperature features observed. Particular mesostructure elements were traced for several km. The deeper structure was found to occur in some association with a rhythmic deepening of constant density surfaces, possibly due to tidal influence. GRA

N75-26625# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MATHEMATICAL METHODS APPLIED TO OCEAN SURFACE TOPOGRAPHY AND SATELLITE GEODESY Final Report
Sep. 1974 32 p refs
(Contract N00014-71-A-0110-0004)
(AD-A003937; SAO-409-090) Avail: NTIS CSCL 08/5

This report summarizes the results of research carried out at Smithsonian Astrophysical Observatory during the period 1 June 1972 through 30 June 1974. Emphasis is given to topics of investigation for the period 1 July 1973 through 30 June 1974. A fundamental problem with the mathematical method encompassed is identified, and a modified approach of spherical sampling discussed. GRA

N75-26626# Delaware Univ., Newark. Coll. of Marine Studies.
HOLOCENE SEDIMENTARY ENVIRONMENT OF THE ATLANTIC INNER SHELF OFF DELAWARE
R. E. Sheridan, C. E. Dill, Jr., and J. C. Kraft Dec. 1974 58 p refs
(Contract N00014-69-A-0407)
(AD-A004650; TR-31) Avail: NTIS CSCL 08/7

High-resolution subbottom profiles and Vibracoring off the Delaware coast confirm the partial retention of Holocene coastal environments under the inner shelf. The Holocene transgression has involved erosion through the Holocene lagoonal sediments in some areas, leaving pre-Holocene ridges exposed on the inner-shelf sea floor where once there may have been headlands. The ancient lagoonal deposits are thickest over depressions in the pre-Holocene surface. The presence of marsh peat, dated as approximately 7,500 yr. B.P., and overlying very fine lagoonal mud proves that lagoonal conditions existed east of Delaware even then. The bottom morphological features of the inner shelf off Delaware are related to dynamic molding of hydraulic bedforms in equilibrium with the present marine environment. Although one ridge form was found to be a subcrop of Pleistocene sand and gravel, most of the ridge and channel topography was found to be formed within the upper Holocene sediments. This is especially true of the shorefaceconnected ridges off Rehoboth Bay and Bethany Beach, the inlet-associated shoals near the mouth of Delaware Bay, and the Delaware shelf-valley flood channel. GRA

N75-26627# Woods Hole Oceanographic Institution, Mass.
PREDICTING THE CHARACTERISTICS OF THE WELL-MIXED LAYER
Rory Thompson Nov. 1974 82 p refs
(Contract N00014-74-C-0262; NR Proj. 083-004)
(AD-A004644; WHOI-74-82) Avail: NTIS CSCL 08/10

Numeric trials are made of some one-dimensional models of the time-varying density structure near the surface of the ocean. The implementations given here of the models seem much faster and simpler than previous versions. The meteorological forcing at OWS N for a year is put in, and the resultant mixed-layer depths and sea-surface temperatures are found to compare well with observation, with correlations around 0.9. The results are not sensitive to grid spacing. Temperature anomalies introduced in the Spring can be covered up in the Summer, yet reappear in the Fall. Clarity of the water has important effects on the heat storage. One of the models has some particularly attractive features for implementation for operational prediction. GRA

N75-26628# Woods Hole Oceanographic Institution, Mass.
HYDROGRAPHIC STATION DATA, CARIBBEAN SEA, ATLANTIS 2 CRUISE 78 AND KNORR CRUISE 37
William G. Metcalf, Marvel C. Stalcup, and Marquerite E. Zemanovic Dec. 1974 148 p refs
(Grant NSF GA-27939)
(PB-239160/5; WHOI-74-90) Avail: NTIS HC $5.75 CSCL 08J

During Cruise 37 of the Research Vessel KNORR, 91 hydrographic stations were occupied, most of them in the general area of the Windward Passage, eastern Cayman Basin, Mona Passage and across the Caribbean Sea from Puerto Rico to Venezuela. Vertical profiles of potential temperature, salinity, dissolved silicate are presented. The data lists include, in addition to the observed parameters, such computed values as pressure, potential temperature, potential density, specific volume anomaly, sound velocity, dynamic height, potential energy, Vaisala frequency and Vaisala period. Also included in the data lists are 28 hydrographic stations occupied during November 1973 on Cruise 78 of the Research Vessel ATLANTIS II in the Windward Passage, Central Caribbean Sea and the Atantic Ocean just east of the Lesser Antilles. GRA

N75-26448 Joint Publications Research Service, Arlington, Va.
EXTRAORDINARY SWELLS
G. V. Rzheplinskiy, G. V. Matushevskiy, and L. A. Yeshchenko *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 86-93 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 68-73 (For availability see N75-26441 17-42)

N75-26449 Joint Publications Research Service, Arlington, Va.
HEAT BALANCE OF THE SEA OF JAPAN AT THE BEGINNING OF THE SPRING WARMUP
V. V. Pokudov and V. P. Tunegolovets *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 94-107 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 74-84 (For availability see N75-26441 17-42)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-26629*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATION OF LUCIFERASE ASSAY FOR ATP TO ANTIMICROBIAL DRUG SUSCEPTIBILITY TESTING Patent Application
Emmett W. Chappelle, Grace L. Picciolo, Michael J. Barza (New Engl. Med. Center), Louis Weinstein (New Engl. Med. Center), Stephanie A. Tuttle (New Engl. Med. Center), and Hillar Vellend, inventors (to NASA) (New Engl. Med. Center) Filed 30 Apr. 1975 29 p
(NASA-Case-GSC-12039-1; US-Patent-Appl-SN-572991) Avail: NTIS HC $3.75 CSCL 06M

A method is described for measuring the susceptibility of bacteria to antimicrobial agents by utilizing the bioluminescent reaction between adenosine triphosphate (ATP) and luciferase-luciferin mixtures. The bacterium is cultured in a growth medium and the amount of ATP in a sample of the bacterium is determined by measuring the amount of luminescent light emitted when the bacterial ATP is reacted with a luciferase-luciferin mixture. A fresh sample of the bacterium is then subjected to an antibiotic

agent and the amount of bacterial ATP is assayed after the antibiotic treatment in the same manner. The ATP index is determined from the values obtained from the assay procedures. NASA

N75-26630*# Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
MECHANISMS OF DETERIORATION OF NUTRIENTS Annual Report, 13 Mar. 1974 - 13 Mar. 1975
Marcus Karel and James M. Flink 13 Mar. 1975 215 p refs (Contract NAS9-12485)
(NASA-CR-141866) Avail: NTIS HC $7.25 CSCL 06H

The retention of flavor during freeze drying was studied with model systems. Mechanisms by which flavor retention phenomena is explained were developed and process conditions specified so that flavor retention is optimized. The literature is reviewed and results of studies of the flavor retention behavior of a number of real food products, including both liquid and solid foods are evaluated. Process parameters predicted by the mechanisms to be of greatest significance are freezing rate, initial solids content, and conditions which result in maintenance of sample structure. Flavor quality for the real food showed the same behavior relative to process conditions as predicted by the mechanisms based on model system studies. Author

N75-26631*# California Univ., Los Angeles.
CONTINOUS ANIMAL EXPOSURE TO A MIXTURE OF DICHLOROMETHANE AND 1,1,1-TRICHLOROETHANE Final Report
1975 25 p refs
(NASA Order T-9035-B)
(NASA-CR-141889) Avail: NTIS HC $3.25 CSCL 06C

An investigation of the effects of combined exposure of animals to dichloromethane and 1,1,1-trichloroethane was conducted using atmospheric concentrations of each solvent which had individually produced minimal measureable effects on livers. Previously established spacecraft threshold limit values for the individual solvent compounds were studied to determine validity when both were present in an astronaut's breathing environment under continuous exposure conditions. Results show that the combined effect of 90-day continuous exposure of animals to 100 ppm dichloromethane and 1000 ppm 1,1, 1-trichloroethane is no greater than the effect of each alone. While the exposed livers of mice appeared to contain slightly more fat, the degree of increased liver weight and the liver-to-body ratios are slightly lower than those measured for each solvent alone. Author

N75-26632*# Scientific Translation Service, Santa Barbara, Calif.
RELATIONSHIP BETWEEN ADMINISTRATION TIME OF DRUGS AND ACUTE TOXICITY IN MICE
Washington NASA Jun. 1975 17 p refs Transl. into ENGLISH from Pharmacologica Japonica, V. 71, 1975 p 29-37
(Contract NASw-2483)
(NASA-TT-F-16411) Avail: NTIS HC $3.25 CSCL 06T

Drugs were injected into dd-strain mice every four hours at 0200, 0600, 1000, 1400, 1800, and 2200 hours, and the cumulative mortality rate was calculated for 72 hours through periodic observations. The following results were obtained: (1) With respect to central stimulants, specifically, N-methyl D-aspartic acid, picrotoxin, pentetrazol, and strychnine-H_2SO_4, the mortality rate of mice injected at 2200 hours was the lowest, while a generally high rate was registered for mice injected at 0200, 1000, and 1800 hours. At least, two or more peaks in the mortality rate were noted. (2) In the case of central depressants such as chlorpromazine and Na-methylhexabital, mice injected at 1000 hours registered the lowest mortality rate, while the highest mortality rate was at 1400 and 1800 hours, with one peak. Author

N75-26633*# California Univ., Davis.
EVALUATION OF THE EFFECTS OF HYPERGRAVITY EXPOSURE AND CAGING RESTRAINT ON BONE MINERALIZATION IN THE BEAGLE BY IN VIVO PHOTON ABSORPTIOMETRY Final Progress Report
Gerald L. Fisher, Karen L. Berding, and Marvin Goldman May 1975 29 p refs
(NASA Order A-98313-A)
(NASA-CR-137710) Avail: NTIS HC $3.75 CSCL 06S

Photon absorptiometry was used to evaluate bone mineral kinetics associated with normal development and the possible perturbations to bone development resulting from hypergravity exposure over a period of six months in developing Beagles. A series of seven measurements were performed at specific times with the first measurement prior to treatment and subsequent measurements at 2, 5, 9, 14, 20 and 26 weeks from the onset of the experiment. Four groups of six male Beagle pups, ranging in age from 85 to 92 days were studied. Two groups were chronically exposed to hypergravity treatments by centrifugation of 2.0 G (18.0 RPM, 11.7 ft radius) and 2.6 G (18.0 RPM, 19.8 ft radius) for the 26 week period. A third group of six dogs served as a caged control to evaluate possible changes due to confinement in small plexiglass cages similar to those of the centrifuge. Thus this control group was subjected to limited exercise due to caging restraint. The fourth group of animals was housed in open runs to allow exercise without the spatial confinement of the smaller plexiglass cages. Results show highly significant differences in body weight, bone length, increase in bone density of control group relative to other groups, and a decrease in bone mineral content in the two gravity treated groups. Author

N75-26634*# Kanner (Leo) Associates, Redwood City, Calif.
A MONTH ALONE WITH CHLORELLA
S. Starikovich Washington NASA Jul. 1975 8 p Transl. into ENGLISH from Khimiya i Zhizn (USSR), no. 5, 1974 p 58-63
(Contract NASw-2481)
(NASA-TT-F-16463) Avail: NTIS HC $3.25 CSCL 06P

A subject, lived in a hermetically-sealed, 4.5 cu m room for 30 days. During this time, his oxygen was completely supplied by chlorella, grown in a special reactor. After a time, the system achieved a degree of stability: carbon monoxide and methane accumulation stabilized after 3 and 12 days, respectively. Waste materials were broken down and purified in a miniature 'aerotank,' similar to those used for city wastes. Water for drinking, food preparation and hygiene was collected from condensation on the reactor and from moisture secreted by the subject's skin and lungs, as well as from waste matter. 50 g of dried chlorella were included in the subject's diet. The life-support system showed no sign of change at the end of the experiment; additional plants and especially animals would improve the system, e.g., make it a 100% closed CO_2 cycle system. Author

N75-26635# Advisory Group for Aerospace Research and Development, Paris (France).
A REVIEW OF ANTHROPOMETRIC DATA OF GERMAN AIR FORCE AND UNITED STATES AIR FORCE FLYING PERSONNEL, 1967 - 1968
H. J. Grunhofer, ed. (German Air Force) and G. Kroh, ed. (German Air Force Inst. of Aviation Med.) Apr. 1975 180 p refs
(AGARD-AG-205; AGARDograph-205) Avail: NTIS HC $7.00

Standardized equipment, definitions and procedures were used according to Hertzberg for each program. Both data collections were obtained from preselected personnel and are not representative of the whole male population of the respective country; however, the results are representative of the reference collectives. For each body dimension the following detailed information is given: the definition, written and illustrated, of body dimension to be measured; the frequency of certain ranges; a breakdown of GAF and USAF data in percentile; essentials on the statistics of data distribution. The correlation matrix of GAF data is also included. Author

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-26636*# Public Health Service Hospital, Staten Island, N.Y.
RENAL EFFECTS OF CONTINUOUS NEGATIVE PRESSURE BREATHING Final Report
Michael J. Kinney and Vincent A. DiScala [1975] 20 p refs
(NASA Order T-2950-A)

(NASA-CR-141888) Avail: NTIS HC $3.25 CSCL 06P

Continuous negative pressure breathing (CNPB) was utilized to simulate the thoracic vascular distension of zero g or space, in 11 anesthetized rats. The animals underwent renal clearance and micropuncture renal nephron studies before, during, and after CNPB. Rats were pretreated with a high salt diet and I-M desoxycorticosterone (DOCA) in excess. None of these rats diuresed with CNPB. In contrast 5 of the 7 remaining rats increased the fraction of the filtered sodium excreted (C sub Na/GFR, $p < .05$) and their urinary flow rate (V, $p < .05$). Potassium excretion increased (U sub k V, $p < .05$). End proximal tubular fluid specimen's TF/P inulin ratios were unchanged. Whole kidney and single nephron glomerular filtration rates fell 10%. CNPB, a mechanism for atrial distension, appears to cause, in rats, a decrease in distal tubular sodium, water and potassium reabsorption. Exogenous mineral-corticoid prevents the diuresis, saluresis, and kaluresis. Author

N75-26637*# Scientific Translation Service, Santa Barbara, Calif.
REDOX TRANSFORMATIONS OF NICOTINAMIDE-ADENINEDINUCLEOTIDE IN SKELETAL MUSCLES DURING WORK AND AT REST
N. R. Chagovets and L. G. Leshkevich Washington NASA Jun. 1975 13 p Transl. into ENGLISH from Vop. Med. Khim. (USSR), v. 20, no. 4, Jul.-Aug. 1974 p 425-429
(Contract NASw-2483)
(NASA-TT-F-16432) Avail: NTIS HC $3.25 CSCL 06P

The determination of beta-hydroxy butyrate dehydrogenase substrate content in rat skeletal muscles is described as a means of more closely evaluating redox transformation of free nicotinamide-adenine-dinucleotide (NAD) in muscle cell mitochondria both at rest and after intense work (15 minutes swimming). During work, muscle NAD reduction uses glycolytes; at rest, NAD reduction takes place using free mitochondrial NAD. The dynamics of pyruvate (lactate and acetoacetate) beta-hydroxy butyrate ratios in the blood are the same as that in the skeletal muscles, and can be used as an index to skeletal muscle energy metabolism. Author

N75-26638*# Scientific Translation Service, Santa Barbara, Calif.
HOW'S YOUR HEALTH, COSMONAUT?
I. Bryanov and R. Bayevskiy Washington NASA 14 Jun. 1975 7 p Transl. into ENGLISH from Izvestiya (USSR), 8 Feb. 1975 p 5
(Contract NASw-2483)
(NASA-TT-F-16331) Avail: NTIS HC $3.25 CSCL 06P

The function of medical specialists during spaceflights is to compare the cosmonaut's current physical state with his previous one, and to predict future health. The three concepts (current, past, and future physical state), and methods for determining them are discussed. Heuristic, mathematical, and clinico-physiological approaches to predicting the physical state are described. The H. Selye adaptation syndrome is discussed, along with a way of monitoring the organisms' approach to the 'over-exertion zone' by mathematical analysis of cardiac rhythm. Author

N75-26639*# Scientific Translation Service, Santa Barbara, Calif.
EFFECT OF LUMISTEROL-3 ON THE CALCIUM ABSORPTION IN THE GUT AND ON THE CALCIFICATION OF BONE TISSUE
N. N. Govseyeva Washington NASA Jun. 1975 9 p refs Transl. into ENGLISH from Prikl. Biokhim. Mikrobiol. (USSR). v. 10, no. 4, Jul. - Aug. 1974 p 581-583
(Contract NASw-2481)
(NASA-TT-F-16422) Avail: NTIS HC $3.25 CSCL 06P

The effect of lumisterol-3 on calcium transport in the intestines and on bone tissue calcium absorption was examined in vitro on the large tibial bone of white leghorn chicks. Four groups of animals were kept on a rachitogenic diet for one month after which one group remained controls, another was administered 400 IU of vitamin D sub 3, the third was administered a mixture of 200 IU of vitamin D sub 3; and 200 IU of lumisterol-3. The latter mixture proved to be the most effective, in increasing calcium absorption in the intestines . Results indicate that lumisterol-3 by itself stimulates more calcium absorption in bone tissue than vitamin D sub 3. Author

N75-26640# Naval Postgraduate School, Monterey, Calif.
EEG FREQUENCY ANALYSIS ON THE PDP LAB 8/E COMPUTER SYSTEM M.S. Thesis
Lawrence Morrison Gorham Sep. 1974 42 p refs
(AD-A003522) Avail: NTIS CSCL 06/5

This thesis describes the analysis, method and computer programs used to obtain the Fast Fourier Transformation (FFT) of an electroencephalogram (EEG) using a small laboratory computer like the PDP Lab 8/E. The EEG power spectrum was then computed from this transformation. The information contained in this thesis is intended to enable the user to compute the Fourier coefficients of a set of data points or compute the power spectrum of a real waveform such as the EEG. GRA

N75-26641# Institute for Behavioral Research, Inc., Silver Spring, Md.
EFFECTS OF MICROWAVE IRRADIATION ON EMBRYONIC BRAIN TISSUE Final Report, 15 Oct. 1973 - 14 Oct. 1974
David McK. Rioch 20 Nov. 1974 12 p refs
(Contract DAHC04-74-C-0004)
(AD-A004024; Rept-151; ARO-11739.1-L) Avail: NTIS CSCL 06/18

Several groups of dated pregnant rats were exposed starting on the 13th day of gestation in the anechoic chambers or in a calibrated oven. All the exposures to microwave irradiation were conducted after 0700 and before 1500 hours. The rats were sacrificed on the 19th day of gestation, the fetuses weighed and their braines fixed and serially sectioned. No differences were found between the irradiated fetuses and the controls which had been similarly handled but not irradiated. In a final experiment rats were exposed to irradiation from 1700 to 1900 hours or overnight (from 1800 to 0800 or 1000 hours) at 1700 MHz and 5 or 10 mw/sq cm, on the 6th to the 9th and the 12th to the 16th days of gestation. The exposed fetuses were heavier than the controls and the brains larger. The difference was approximately 10 percent. This finding suggests that the effect may be due to some factor which varies with the circadian rhythm. It may also have resulted from the earlier or the repeated irradiation. GRA

N75-26642# Pennsylvania Univ., Philadelphia.
STUDY OF THE IN VIVO MECHANICAL PROPERTIES OF THE BLOOD VESSELS AND THEIR REGULATION Final Report
Lysle H. Peterson 1975 31 p refs
(Contract N00014-67-A-0216-0025)
(AD-A003613) Avail: NTIS CSCL 06/16

The general objective of the program was to increase and improve knowledge and understanding of the properties and behavior of the circulatory system under normal operating and diseased conditions. The diseased condition being emphasized was hypertension, although the study related to other abnormal states such as shock and also provided insight into the arteriosclerotic process. The study dealt extensively with the chemical, metabolic and physical characteristics of blood vessels and with how nervous, endocrine and renal functions control cardiovascular properties and behavior. An important aspect of the study was the approach being taken, i.e., the systems approach. GRA

N75-26643# Army Chemical Center, Edgewood, Md.
A REVIEW OF THE TOXICOLOGY OF COLORED CHEMICAL SMOKES AND COLORED SMOKE DYES
Edmund J. Owens and Dorothy M. Ward Dec. 1974 71 p refs
(DA Proj. 1C5-22301-A-079)
(AD-A003827; EB-TR-74064) Avail: NTIS CSCL 06/20

The report is a review of the inhalation (total-body-exposure) studies performed by this laboratory during 1966 with the M18 series of colored smokes. The acute toxicities of the smokes, the times to death, and the gross signs are compared. A literature survey and toxicological evaluation of the various dyes in the violet, green, and red smoke mixtures are included. Studies necessary for definition of the hazards incident to the use of the dye components in manufacturing and military operations as well as knowledge gaps are described. The dyes used in chemical smokes are: 1-methylaminoanthraquinone; dibenzo

(b,def) chrysens-7, 14-dione; 7H-benz (de) anthracene-7-one and 1,4-di-p-toluidinoanthraquinone. GRA

N75-26644# Center for Blood Research, Boston, Mass.
FROZEN BLOOD CELL CHANGES Final Report, 1 Sep. 1969 - 30 Nov. 1974
Fabian J. Lionetti 15 Jan. 1975 9 p refs
(Contract N00014-69-C-0128; NR Proj. 105-440)
(AD-A003611; TR-6) Avail: NTIS CSCL 06/16

Several fundamental characteristics of human red cells, bone marrow, and peripheral blood granulocytes have been elucidated, which have led to enhancement of knowledge concerning blood cell preservation and senescence of red cells. The accumulation of calcium ion from plasma in red cells aging in vivo or in blood bags, results in non-deformable cells subject to splenic sequestration. Red cell viability depends on prevention of calcium ion entry and accumulation. The application of electronic cell sizing makes possible the rapid evaluation of bone marrow and peripheral blood leukocytes. Techniques developed for use in pursuit of research for this contract are invaluable as they permit rapid and simple assessment of cell quality affording means to optimize preservation and yielding viable post-thawed cells. GRA

N75-26645# Union Carbide Corp., Tarrytown, N.Y.
ACCESS: DIVER PERFORMANCE AND PHYSIOLOGY IN RAPID COMPRESSION TO 31 ATMOSPHERES
R. W. Hamilton, Jr., T. C. Schmidt, D. J. Kenyon, M. Freitag, and M. R. Powell 1 Dec. 1974 87 p refs Prepared in cooperation with Ocean Systems, Inc., Tarrytown, N. Y.
(Contracts N00014-74-C-0415; N00014-74-C-0424; N00014-74-C-0189)
(AD-A003514; CRL-T-789) Avail: NTIS CSCL 06/19

In a series of simulated dives--called Access-compressions were made to 800 and 1000 feet of sea water from sea level and also to these depths from holding depths of 500 and 600 feet of sea water. Compression rate was 100 feet per minute with one or two one-minute stops. The breathing gas was 3.5% oxygen and 13% nitrogen, balance helium, to give a bottom gas mixture of approximately 1 atmosphere of oxygen and about 4 atmospheres of nitrogen. The experimental program showed clearly that diving to 1000 feet of sea water can be accomplished efficiently and safely by means of excursions from moderate depths, and provided decompression procedures for such excursions. It was further shown that present saturation decompression practice can probably not be accelerated very much, and that a practical limit for present open-circuit breathing apparatus is being approached. GRA

N75-26646# Union Carbide Corp., Tarrytown, N.Y.
NEON DECOMPRESSION Final Report, 1 Jan. - 31 Dec. 1974
R. W. Hamilton, Jr., M. R. Powell, D. J. Kenyon, and Mark Freitag 31 Dec. 1974 20 p refs
(Contract N00014-74-C-0424; NR Proj. 201-088)
(AD-A003506; CRL-T-797) Avail: NTIS CSCL 06/19

During the current contract year this Laboratory has conducted a feasibility program on the applications of neon in mixed-gas diving. The neon source studied was a by-product of the manufacture of atmospheric gases; it is composed of 25% helium, 75% neon. To develop the decompression tables, modifications of classical theory were applied to existing diving data, mainly experience with helium. The resulting decompression schedules proved to be unexpectedly troublesome in causing sensory problems and delayed effects--whether designed for helium or neon--and satisfactory decompressions could be achieved only if oxygen breathing was included. The planned array of tests over a range of depths and times (150-400 feet sea water and 30-120 min) was set aside, and efforts were concentrated on producing a dependable table for 250 feet sea water/60 min. GRA

N75-26647# Union Carbide Corp., Tarrytown, N.Y.
STUDIES OF DECOMPRESSION PHENOMENA Final Report, 1 Jan. - 31 Dec. 1974
Michael R. Powell 31 Dec. 1974 18 p refs
(Contract N00014-74-C-0415; NR Proj. 201-035)
(AD-A003513; CRL-T-800) Avail: NTIS CSCL 06/19

The report describes biophysical studies of the etiology of decompression sickness and methods for its early detection. The authors have made an extensive study of bubble detection in the precordial region of human divers by means of the Doppler ultrasound bubble detector. Results indicate that only a fair correlation exists for premonitory detection of decompression sickness if this is the sole monitoring site. Gas uptake and elimination in the skeletal muscle of rabbits for nitrogen and argon was studied. Within the limits of accuracy, no difference between the halftimes for argon or nitrogen could be detected. Elimination was found to be slower than uptake for both gases. These measurements were made simultaneously for both gases by means of in situ probes and a mass spectrometer analyzer. GRA

N75-26648# Environmental Health Lab., Kelly AFB, Tex.
INDUSTRIAL HYGIENE SURVEY. 123RD TACTICAL CONTROL SQUADRON (CRP), OH ANG, BLUE ASH OH 45242 Final Technical Survey Report
Lawrence W. Grauvogel Dec. 1974 27 p refs
(AD-A003491; EHL(K)-74-29) Avail: NTIS CSCL 06/10

A hazardous noise and industrial hygiene survey was conducted 23-26 September 1974. Personnel exposed to potentially hazardous noise and sources and areas of potentially hazardous noise are identified by shop. Ventilation is discussed for the shops and recommendations made. Comprehensive listing by shop of chemicals used and composition are included to aid the physician in identification of the possible source of occupational illnesses. GRA

N75-26649# School of Aerospace Medicine, Brooks AFB, Tex.
PRINCIPLES OF BIODYNAMICS. INTRODUCTION TO GRAVITATIONAL BIOLOGY, 1
Arthur H. Smith Nov. 1974 51 p refs
(AD-A003624; SAM-Review-8-74; SAM-TR-74-44) Avail: NTIS CSCL 06/19

Gravity and other acceleration fields affect exposed organisms through the induced weight-to-mass ratio, which is generally indicated as G. Biological response to such fields, and to changes in field strength, is the subject matter of gravitational biology. Immediate response to increases in the ambient acceleration field includes the greater energy requirement for mechanical work and displacement of materials in nonrigid systems. There also are secondary changes, such as an increased nutritional requirement and blood volume increase. A particularly important condition to gravitational biology is weightlessness. Here the effects of earth-gravity are removed, and the intensities of the remaining biological functions are mass determined. This review deals with the physical bases of gravitational biology and the descriptive terminology available. GRA

N75-26650# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
EFFLUX OF GASEOUS HYDROGEN OR METHANE FUELS FROM THE INTERIOR OF AN AUTOMOBILE Final Technical Note
J. M. Arvidson, J. Hord, and D. B. Mann 1 Mar. 1975 59 p refs Sponsored in part by General Services Admin.
(COM-75-10288/9; NBS-TN-666) Avail: NTIS HC $4.25 CSCL 13F

Gasoline-powered automobiles are being converted to operate on gaseous fuels such as H2 or CH4. These fuels are commonly stored in containers located in the trunk of the car. Potential leakage of these gaseous fuels into the passenger compartment of the vehicle constitutes a safety threat. Definitive experiments were performed to identify the explosion hazards, establish venting criteria and obviate general safeguards for H2 or CH4 fueled passenger vehicles. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-26651*# Essex Corp., Huntsville, Ala.
EARTH ORBITAL TELEOPERATOR MANIPULATOR SYSTEM EVALUATION PROGRAM
M. Kirkpatrick, III, N. L. Shields, Jr., P. N. Frederick, R. Brye, and T. B. Malone Feb. 1975 84 p refs
(Contract NAS8-30545)
(NASA-CR-143874; Rept-2) Avail: NTIS HC $4.75 CSCL 05E

The performance of an orbital teleoperator system which includes small dextrous servicing manipulators to be used in satellite servicing was examined. System/operator performance testing was implemented and the results of a fine positioning control test using two different manipulator systems varying widely in manipulator configuration and control systems are presented. Fine position control is viewed as representing a fundamental requirement placed on manipulator control. The relationship of position control to more complex tasks which directly represent on-orbit servicing operations are also presented. Author

N75-26652*# Essex Corp., Huntsville, Ala.
EARTH ORBITAL TELEOPERATOR VISUAL SYSTEM EVALUATION PROGRAM
N. L. Shields, Jr., M. Kirkpatrick, III, P. N. Frederick, and T. B. Malone Feb. 1975 85 p refs
(Contract NAS8-30545)
(NASA-CR-143875; Rept-3) Avail: NTIS HC $4.75 CSCL 05E

Empirical tests of range estimation accuracy and resolution, via television, under monoptic and steroptic viewing conditions are discussed. Test data are used to derive man machine interface requirements and make design decisions for an orbital remote manipulator system. Remote manipulator system visual tasks are given and the effects of system parameters of these tasks are evaluated. E.H.W.

N75-26653# Civil Aeromedical Inst., Oklahoma City, Okla.
A REALISTIC VIEW OF THE PEOPLE IN AIR TRAFFIC CONTROL
Roger C. Smith Dec. 1974 6 p refs
(AD-A006789; FAA-AM-74-12) Avail: NTIS HC $3.25 CSCL 05/5

An overview of research findings on air traffic controllers is presented. Results of personality, aptitude, motivation, interest, and attitude studies are considered in terms of the general pattern of characteristics found to be associated with success in the air traffic profession. The implications of these findings for managerial programs are discussed. Author

N75-26654# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Abteilung Luftfahrtpsychologie.
FACTOR ANALYSIS OF A NEW MULTI-DIMENSIONAL PERSONALITY QUESTIONNAIRE. A CHECK OF THE FACTOR MODEL IN COMPARISON WITH SIMILAR METHODS
Helmut Kirsch, Klaus-Martin Goeters, and Rainer Ewe 21 Jan. 1975 26 p refs In GERMAN; ENGLISH summary
(DLR-FB-75-20) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. 12,20 DM

A personality inventory, the Temperament-Structure-Scales, was developed for the psychological selection of aviation personnel. The inventory includes questions about attitudes, behavior and biographical events. The questions are arranged in nine trait scales which are described. The nine scales were split in half (odd-even). The matrix of correlations of the resulting 18 half-scales was factor-analyzed. The results are reported and compared with a similar research on the 16 P.-F.-test and on the HSPQ. The psychometric data are discussed. The assumed 9-factor-structure was confirmed sufficiently. This structure of traits seems to correspond with conceptions which parents and social environment have about educational aims. Author (ESRO)

N75-26655# Stanford Univ., Calif. Dept. of Computer Science.
INFORMATION PROCESSING ANALYSIS OF VISUAL PERCEPTION: A REVIEW
A. J. Thomas and T. O. Binford Jun. 1974 62 p refs
(Contract DAHC15-73-C-0435; ARPA Order 2495)
(AD-A003483; SU-STAN-CS-74-408; SU-AIM-227) Avail: NTIS CSCL 05/10

It is suggested that recent advances in the construction of artificial vision systems provide the beginnings of a framework for an information processing analysis of human visual perception. A review is made of some pertinent investigations which have appeared in the psychological literature, along with some of the salient and potentially useful theoretical concepts which have resulted from the attempts to build computer vision systems. An attempt is made to integrate these two sources of ideas to suggest some desirable structural and behavioral concepts which apply to both the natural and the artificial systems. GRA

N75-26656# Computer Image Corp., Denver, Colo.
THE EFFECTS OF OBSERVER CONTROL OVER VISUAL INFORMATION IN CLASSIFICATION PERFORMANCE Final Technical Report
Louis Cicchinelli and Joseph Halpern Nov. 1974 77 p refs
Prepared in cooperation with Denver Univ.
(Contract N00014-74-C-0117)
(AD-A003953) Avail: NTIS CSCL 05/10

A series of experiments is reported which investigated the effects on performance of observer control over certain information parameters of a dynamic visual display. The results showed that classification performance was enhanced when experienced observers could eliminate and attenuate information. When naive observers were presented with this attenuated information set, their performance was superior to that of a comparable group shown the entire information set. These results were consistent across two different, but related, sets of stimuli; ambient sea noises and ship sounds. GRA

N75-26657# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE MATRIX ORGANIZATION IN ASD: A STUDY IN COLLOCATION OF ENGINEERS M.S. Thesis
Cheryl L. Moyer Sep. 1974 269 p refs
(AD-A003604; GSM/SM/74D-9) Avail: NTIS CSCL 05/9

The purpose of this study is to determine if there are peculiar human relations problems associated with the matrix form of organization as applied in the Aeronautical Systems Division (ASD) of the Air Force Systems Command. The data for this study was gathered by the interview questionnaire method. The questionnaire was designed to determine the work motive values, job satisfaction, and the current work conditions or climate as perceived by the engineers interviewed. The analyses consisted mainly of: (1) Contingency Table Tests, (2) Tabulations, and (3) Subjective Comparisons. The major variables selected for analysis were: (1) work assignment categories of (a) dedication, (b) collocation, and (c) functional (not collocated or dedicated); (2) work location categories of (a) ASD SPO, (b) Super SPO, and (c) Home Office; (3) civilian or military, and (4) age categories of (a) under 35, (b) 35 through 49, and (c) 50 and older. The major findings of the analyses were grouped into eight major categories and recommendations relevant to each category were made. GRA

N75-26658# Illinois Univ., Savoy. Aviation Research Lab.
ENHANCEMENT OF HUMAN EFFECTIVENESS IN SYSTEM DESIGN, TRAINING, AND OPERATION Annual Progress Report, 1 Jul. 1973 - 30 Jun. 1974
Jun. 1974 20 p refs
(Contract F44620-70-C-0105)
(AD-A004149; ARL-74-19/AFOSR-74-13; AFOSR-75-0073TR) Avail: NTIS CSCL 05/10

The Progress Report is concerned with research performance and results on the contract during the period 1 Jul 1973 - 30 June 1974. On a very general classification level, the tasks are of two general types, those dealing with human resources research and those dealing with manned systems research. More specifically, four tasks (2, 4, 5, and 8) deal primarily with pilot selection and training, performance assessment, and the prediction of future operational effectiveness; three tasks (1, 3, and 7) deal with human perceptual and decision processes and with principles of aviation display, control, and computer-assisted manned system design; and Task 6 bridges both major research categories. Furthermore, several of the tasks (particularly 1, 4,

6, 7, and 8) are aimed at advancing human factors research methodology and theory. GRA

N75-26659# Naval Postgraduate School, Monterey, Calif.
PREDICTION OF PERFORMANCE AND SATISFACTION OF AERONAUTICAL ENGINEERING STUDENTS AT THE NAVAL POSTGRADUATE SCHOOL M.S. Thesis
Charles Theodore Sofge Sep. 1974 79 p refs
(AD-A003539) Avail: NTIS CSCL 05/10

A primary objective of this research was the development of predictors of academic performance and satisfaction for aeronautical engineering students. Three basic types of data used to develop predictors were biographical (historical), academic aptitude (graduate record exam), and individual interests (strong vocational interest blank) data. Several successful predictors of performance were developed but further research is required to successfully predict student satisfaction. GRA

N75-26660# Naval Postgraduate School, Monterey, Calif.
PERIODIC VARIATIONS IN HUMAN PERFORMANCE M.S. Thesis
Francis Leroy Sink Sep. 1974 50 p refs
(AD-A003517) Avail: NTIS CSCL 05/10

This paper investigates the periodic variation in human performance predicted by Biorhythm theory. Fourier analysis was performed on performance data of three subjects. The results indicated that the postulated basic biorhythmic cycles exist. Comparison of the phase of predominate experimental frequency with the phase predicted by biorhythm indicated that the frequencies may not be as stable as the theory suggests. GRA

N75-26661# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STUDY OF THE PERSONAL VALUE SYSTEMS AND JOB SATISFACTIONS OF UNITED STATES AIR FORCE OFFICERS M.S. Thesis
John A. Madia Oct. 1974 105 p refs
(AD-A003602; GSM/SM/74D-7) Avail: NTIS CSCL 05/10

The primary objectives of this research were to gain insights into the personal value systems and job satisfactions of Air Force officers. Prior to analyzing data, the paper discusses the role of values in human behavior and outlines the major job satisfaction theories currently in the literature. Using an adaptation of England's methodology the primary orientations (POR) of 1321 officers, as well as the behavioral relevance of 77 personal values (PV) concepts were determined. A modification of Hoppock's general job satisfaction blank was used to measure the satisfactions of the officers. Through tests of means and analysis of distributions, the satisfactions of the various officer subgroups were then compared. GRA

N75-26662# Naval Postgraduate School, Monterey, Calif.
VISUAL SEARCH PROCESSES OF COAST GUARD AIRCREWMEN M.S. Thesis
David Allen Jones Dec. 1974 61 p refs
(AD-A004252) Avail: NTIS CSCL 05/10

The thesis presents the various components of the visual search process as it applies to Coast Guard lookouts. It begins with a description of the human eye and follows with an introduction to detection lobe theory. Next, the most distinct region of daylight vision, the foveal vision area, is discussed. GRA

N75-26663# Yale Univ., New Haven, Conn. School of Organization and Management.
HUMAN BEHAVIOR IN PROBLEM SOLVING ENVIRONMENT Final Report
Robert B. Fetter 24 Jan. 1975 11 p refs
(Contract N00014-67-A-0097-0010; NR Proj. 121-408)
(AD-A004305) Avail: NTIS CSCL 05/10

The major purpose is to study human behavior in problem solving environments involving the use of computers. It was assumed that a major deterrent to effective use of computer technology in problem solving was the lack of knowledge concerning the interaction between man and machine. By giving structure to this aspect of problem solving behavior and studying it experimentally, it was felt that knowledge useful in the design and development of decision support systems could be obtained. While the study of user behavior was a consistent theme of work accomplished and resulted in some fundamental additions to knowledge, the largest part of the effort was devoted to developing the computer systems technology necessary to provide the experimental environment. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-26664 Stanford Univ., Calif.
FACTORS AFFECTING CONTROL ALLOCATION FOR AUGMENTED REMOTE MANIPULATION Ph.D. Thesis
Douglas Edward McGovern 1975 236 p
Avail: Univ. Microfilms Order No. 75-13556

A method for predicting the effectiveness of an augmented remote manipulator system is presented. Such a system represents the combination of a manipulator with a human operator and a small computer. Both the human and the computer have the capability for generating commands to control the manipulator. The performance of the integrated man-machine system can be predicted through the combination of manual control data with a model of the augmentation scheme. This involves the description of human behavior in a form which allows comparisons of the time required by the human to perform a task with and without augmentation. A set of experiments was conducted to generate the necessary human performance data. Results from these experiments are used to investigate some aspects of task description and manipulator rating as well as establishing the form of human performance. The experimentally derived manual control data can be used to predict the performance of an augmented remote manipulator system. Dissert. Abstr.

N75-26665*# Minnesota Univ., Minneapolis.
PERSONNEL TECHNIQUES NECESSARY TO MAXIMIZE BIO-BARRIER INTEGRITY AT A MARTIAN RECEIVING LABORATORY Annual Report, 1 Jul. 1974 - 30 Jun. 1975
G. S. Michaelson and Thomas A. Mahoney 30 Jun. 1975 13 p refs
(Grant NGL-24-005-160)
(NASA-CR-142963) Avail: NTIS HC $3.25 CSCL 06B

The planning of biological isolation measures for the Mars Surface Sample Return Mission is discussed in terms of personnel and organizational management. Deficiencies in past operation of the Lunar Receiving Laborator are analyzed. It was found that the failure to clearly define relationship among the government agencies involved and to effectively integrate their objectives and responsibilities was a major cause of Laboratory deficiencies. Possible solutions to these problems are presented for application to future missions. D.M.L

N75-26666*# Hamilton Standard, Windsor Locks, Conn.
STUDY AND ASSESSMENT OF ADVANCED ETC/LSS APPLICATION TO SPACE SHUTTLE Final Report
Charles L. Beal Apr. 1975 208 p refs
(Contract NAS9-13964)
(NASA-CR-141872; SVHSER-6523) Avail: NTIS HC $7.25 CSCL 06K

A variety of advanced life support components and subsystems are evaluated to determine their potential application to the space shuttle and related vehicles. Author

N75-26667*# Southwest Research Inst., San Antonio, Tex.
A GAS FLOW INDICATOR FOR PORTABLE LIFE SUPPORT SYSTEMS Final Technical Report
R. L. Bass, III and E. C. Schroeder May 1975 164 p refs
(Contract NAS9-13575; SwRI Proj. 02-3713)
(NASA-CR-141892) Avail: NTIS HC $6.25 CSCL 06K

A three-part program was conducted to develop a gas flow indicator (GFI) to monitor ventilation flow in a portable life support system. The first program phase identified concepts which could potentially meet the GFI requirements. In the second phase, a working breadboard GFI, based on the concept of a pressure

sensing diaphragm-aneroid assembly connected to a venturi, was constructed and tested. Extensive testing of the breadboard GFI indicated that the design would meet all NASA requirements including eliminating problems experienced with the ventilation flow sensor used in the Apollo program. In the third program phase, an optimized GFI was designed by utilizing test data obtained on the breadboard unit. A prototype unit was constructed using prototype materials and fabrication techniques, and performance tests indicated that the prototype GFI met or exceeded all requirements. Author

N75-26668# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
OPTIMIZATION OF CONTROL SIGNAL GAIN BY SELF-ADJUSTMENT [DIE OPTIMIERUNG DER BEDIENSIGNAL-VERSTAERKUNG DURCH SELBSTEINSTELLUNG]
W. Kruse and G. Rotbauer Mar. 1974 49 p refs In GERMAN; ENGLISH summary
(FB-13) Avail: NTIS HC $3.75; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. DM 10

An optimization method was developed allowing for continuous adjustment of control gain by the operator. An optimal gain was found by measuring errors with 5 control gain settings for a two-dimensional pursuit display, first order tracking system, and fingerstick control. The optimal control gain was also optimal with respect to operator load. The experiment, with 10 poorly and 5 well trained subjects, showed that the optimal gain was not affected by the degree of training. In a second experiment, with control gain continuously adjustable by the subjects themselves, the well trained subjects tended to adjust to the previously determined optimum rather accurately in a short time. The poorly trained subjects tended to select the left or right margin of the optimal setting depending on the initial control gain setting. ESRO

N75-26669# Navy Experimental Diving Unit, Washington, D.C.
ABSTRACTS BIOMEDICAL RESEARCH AND UNDERWATER BREATHING APPARATUS EVALUATION DIVES 10 TO 1600 FEET CONFERENCE Final Report
L. W. Raymond and W. H. Spaur Apr. 1974 33 p Conf. held on 1-2 Apr. 1974
(AD-A003472; NEDU-23-74) Avail: NTIS CSCL 06/19

The report presents the results and tentative conclusions of biomedical research and underwater breathing apparatus evaluation performed in a series of dives ranging from 10 to 1600 feet. GRA

N75-26670# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
THE MODULAR ANTI-EXPOSURE SYSTEM
Richard L. Bell 25 Jun. 1974 27 p
(AD-A003603; NADC-74139-40) Avail: NTIS CSCL 06/17

The components of the system are a lightweight, constant-wear, liquid loop garment, an encapsulating life raft, and a thermoelectric portable power plant. The full length liquid loop garment, worn integrally with a lightweight coverall, will be essentially the basic clothing configuration required by the airman for a normal mission. In the event of ejection, the encapsulating life raft will deploy and completely enclose the airman during parachute descent. The portable power plant, called the Downed Airman Power Source (DAPS), requires no batteries for its operation. It will simultaneously provide heat energy for warming the downed survivor, and electrical energy for operation of a survival radio. Subjective tests have demonstrated that the Modular Anti-Exposure System performs adequately in maintaining a survivor for up to 24 hours in an extremely low temperature environment. GRA

N75-26671# Boeing Computer Services, Inc., Seattle, Wash. Space and Military Applications Div.
PROMETHEUS, A USER ORIENTED PROGRAM FOR HUMAN CRASH DYNAMICS Computer Program User Manual
David W. Twigg and Richard N. Karnes Nov. 1974 270 p refs
(Contract N00014-72-C-0223)
(AD-A004656; BCS-40038) Avail: NTIS CSCL 13/12

PROMETHEUS is an efficient, user oriented interactive simulation program to study the effects of vehicle crashes on human occupants. A vehicle occupant is modeled as a two dimensional, seven link, mass-spring dynamic system restrained by seat belt and shoulder harness subject to an arbitrary impulsive force. An arbitrary energy absorbing seat interacts with the occupant. Detailed descriptions of how to use the program along with a sample example are presented. The program is designed to operate on the CDC 6600 computer in either a batch or interactive mode. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N75-26672# Joint Publications Research Service, Arlington, Va.
STATE OF AND PROSPECTS FOR DEVELOPING CYLINDRICAL MAGNETIC FILM MEMORIES
L. A. Grigoryan 18 Jun. 1975 14 p refs Transl. into ENGLISH from the book "Zapominayushchiye Ustroystva" Leningrad, Izd. Energiya, 1974 p 69-81
(JPRS-65038) Avail: NTIS HC $3.25

The development of a technique for producing a cylindrical magnetic film (CMF) deposited on a wire by the electrochemical method is traced from 1960 to 1974. The advantages of CMF is briefly discussed and the CMF manufacturing process is outlined. Applications of CMF in high-speed general purpose computers, missile and spacecraft guidance computers, telephone switchboards, and in control computers for automatic machines is discussed. L.B.

N75-26673# Technische Universitaet, Munich (West Germany).
THE AUTOMATIC PATCHBOARD: CONSTRUCTION, GRAPHIC THEORETICAL DESCRIPTION, PRACTICAL APPLICATION Ph.D. Thesis [DAS AUTOMATIC PATCHBOARD: STRUKTURELLER AUFBAU, GRAPHENTHEORETISCHE BESCHREIBUNG, PARKTISCHE REALISIERUNG]
Dieter Wiesenbart 19 Jun. 1974 117 p refs In GERMAN
Avail: NTIS HC $5.25

The development of an automatic patchboard for the preparation of hydrid computer simulation systems is considered. An integrated programming system is reported that uses a structural analysis algorithm to determine the special structure of certain problems describing switches and switching systems through coordination and connection of data components.
Transl. by G.G.

N75-26674# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

DYNAMICAL TRIDIMENSIONAL INFORMATION DISPLAY ON SCREENS [DYNAMISCHE 3DINFORMATIONS DARSTELLUNG AUF BILDSCHIRMEN]
K.-F. Kraiss Jun. 1974 81 p refs In GERMAN; ENGLISH summary
(FB-17) Avail: NTIS HC $4.75; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. DM 10

A system is described for the generation of dynamic, three dimensional pictures on CRT-screens using stroke-writing techniques. The calculations needed for dynamic image transformations were performed in a special purpose digital processor, which performs rotation, translation, scaling, and projection. The efficiency of this system component is characterized by an accuracy of 11 bits and a computation time of about 4 microseconds. This processor is controlled by a PDP-11/20 computer. An introduction is given to the programming of the system, along with illustrations. Color coding of the displayed information is possible by using a multilayer-tube (Penetron) with very high resolution. Author (ESRO)

N75-26675# New York Univ., N.Y. Informatics Lab.
AUTOMATIC DATA PROCESSING TECHNIQUES FOR GRAPHIC-DATA DISPLAY GENERATION AND ANALYSIS Final Scientific Report, 1 Sep. 1969 - 31 Aug. 1974
Herbert Freeman 1974 16 p refs
(AF Proj. 9769)
(AD-A003605; AFOSR-74-1918TR) Avail: NTIS CSCL 09/2

Research under this grant was concerned with computer graphics and image processing, and consisted of the following 7 specific investigations: (1) development of efficient algorithms for line-drawing processing, (2) optimum two-dimensional layout, (3) discrete-time systems with parallel processes, (4) solution of the hidden-line problem for curved objects, (5) data structures for computer graphics, (6) the computer reconstruction or three-dimensional objects from multiple two-dimensional projections, and (7) detection of edges in noisy photographs. A list of publications resulting from the work is included. GRA

N75-26676# Pittsburgh Univ., Pa.
REGENERATION OF INFORMATION RATHER THAN INFORMATION RETRIEVAL. CONCEPT CREATION METHOD Final Report, 1 Jan. 1973 - 31 Jul. 1974
Jack Belzer, Claude E. Stanley, Jr., and Craig Prentiss 1 Dec. 1974 98 p refs
(Contract N00014-67-A-0402-0007)
(AD-A003617) Avail: NTIS CSCL 05/2

Several approaches were considered for the isolation and/or selection of concepts from documents. Two of these approaches were adopted. The first involved the computation of association factors for word adjacency, sentence association, and paragraph cluster. These factors were based upon the number of joint appearances compared to the number of individual appearances of the words involved. The second approach involved the formation of statistical phrases-strings of important words bounded on the ends by punctuation or words from the unimportant word list. Using the two associative measures -- sentence association and paragraph cluster -- attempts at retrieval were made along the lines of the earlier manual extracts and concepts. Section two describes an independent experiment on new materials as a check on the effectiveness of the computer programs. The tests indicate that automatic extraction is feasible, however more refinement in the programs is necessary; particularly the PHRASES-SEARCH system needs improvement to cope with natural language input. GRA

N75-26677# California Univ., Berkeley. Electronics Research Lab.
FORTRAN AUTOMATIC CODE EVALUATION SYSTEM (FACES), PART 1
C. V. Ramamoorthy and S. F. Ho 25 Jul. 1974 499 p refs
(Contract N00014-69-A-0200-1064)
(AD-A004168; ERL-M466-Pt-1) Avail: NTIS CSCL 09/2

This report is the documentation of the FORTRAN Automatic Code Evaluation System (FACES) which is designed to serve as an automatic aid in analyzing, debugging and partially validating large FORTRAN programs. The documentation includes the user manual, source listing and a sample run. GRA

N75-26678# Naval Academy, Annapolis, Md. Div. of Engineering and Weapons.
THE INTRINSIC METHOD FOR CURVE DEFINITION Interim Report, 1 Jul. - 31 Dec. 1974
J. Alan Adams 1 Jan. 1975 55 p refs
(RR01403; NR Proj. 004-460)
(AD-A003939; EW-1-75) Avail: NTIS CSCL 09/2

This report describes a technique of curve description for computer graphics based upon specified intrinsic equations of curvature and torsion as functions of a natural parameter. These intrinsic equations appear as variable coefficients in the Serret-Frenet equations, which are coupled, parametric, differential equations describing the basic analytic nature of a curve. Unique curves are generated by the numerical solution of the Serret-Frenet equations with respect to a specific coordinate system. GRA

N75-26679# TRW Systems Group, Huntsville, Ala.
ADVANCED SIMULATION FACILITY DATA PROCESSING SYSTEMS PERFORMANCE ANALYSIS Final Report
David C. Hall, Robert C. McCoy, and Robert G. Payne Dec. 1974 79 p refs
(Contract DAAH01-74-C-0617)
(AD-A003589; TRW-26628-6921-001) Avail: NTIS CSCL 09/2

This final report is a summary of activities and work accomplished under the contract, Advanced Simulation Facility Data Processing System Performance Analysis. Use of the simulator developed under the contract was directed to the accomplishment of the following objectives: Model enhancement and simulator validation; refinement of jobstream data requirements; ASCDPS system evaluation. GRA

N75-26680# Naval Postgraduate School, Monterey, Calif.
HARDWARE IMPLEMENTATION OF RECURSIVE FIXED-POINT DIGITAL FILTERS FOR MINIMUM QUANTIZATION NOISE M.S. Thesis
Carlos Jose deAlmeida Rodrigues-Rodolfo Sep. 1974 142 p refs
(AD-A003540) Avail: NTIS CSCL 09/2

Design and implementation of recursive digital filters with fixed point arithmetic using special hardware are considered in detail and applied to a mechanization of a second order filter structure with variable coefficients. Two methods of performing quantization after arithmetic operations within a digital filter are presented: quantization after addition and quantization before multiplication. GRA

N75-26681# Arizona Univ., Tucson. Optical Sciences Center.
IMAGE RESTORATION STUDIES Final Report
J. J. Burke, J. D. Gaskill, V. N. Mahajan, and R. E. Wagner Aug. 1974 229 p refs
(Contract DAAD07-72-C-0142)
(AD-A004036) Avail: NTIS CSCL 09/2

This report describes various image restoration methods. Statistical estimation theory has been used for abstracting event information from noisy, blurred photographic images. A computer algorithm has been developed which produces good estimates of unresolved star fields and bar targets. Four coherent optical techniques to measure the orientation of a missile image recorded on film have been investigated. The matched filter and the binary filter techniques appear to be promising. A novel approach to real-time wavefront correction, using diffraction of light by sound waves, is described. GRA

N75-26682# Princeton Univ., N.J. Dept. of Electrical Engineering.
SOME NEW REALIZATIONS OF DEDICATED HARDWARE DIGITAL SIGNAL PROCESSORS Interim Report
A. Peled (Watson (Thomas J.) Res. Center) and B. Liu Oct. 1974 7 p refs Submitted for publication
(Grants AF-AFOSR-2101-71; NSF GK-24187; AF Proj. 9749)
(AD-A003987; AFOSR-74-1898TR) Avail: NTIS CSCL 09/2

The significant breakthroughs in the area of semiconductor technology have opened up new options for the implementation of digital signal processors. The authors suggest some new hardware realizations of such dedicated processors that capitalize on the advances in semiconductor memory technology to produce realizations that have a significantly lower package count and

power consumption and also make possible higher speeds of operation. The authors specifically discuss the realization of digital filters and high speed Fast Fourier Transformers. GRA

N75-26683# General Electric Co., Syracuse, N.Y. Electronics Lab.
INTERACTIVE CURVE FITTING ANALYSIS Final Technical Report, 19 Jun. 1973 - 19 Jun. 1974
R. D. Berlin Jan. 1975 40 p refs
(Contract F30602-73-C-0364)
(AD-A004867; RADC-TR-74-323) Avail: NTIS CSCL 09/2

The primary functions of the ICF (Interactive Curve Fitting) system are: (1) to permit the convenient display of sampled data files along with functional fits to that data in a manner designed to allow easy comparison between the two; (2) to permit sampled data files to be fit with functions variously constrained in form and boundary behavior; (3) to permit the piecewise construction of function files from sampled data files so that any desired portion of a data file may be given a functional representation; (4) to process and combine functional files using a variety of arithmetic and analytic operations; and, (5) to convert function files, normally produced by fitting sampled data files, back into sampled data file format for output or further processing. The first section of this report outlines the main details of how the above functions have been implemented, omitting operational procedures which may be found in the ICF User's Manual. The second section discusses why the present mode of implementation was chosen among the possible alternatives that were studied; and the last section offers suggestions for advancing the capabilities of the present system. GRA

N75-26684# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
RELIABILITY MODELING OF COMPENSATING MODULE FAILURES IN MAJORITY VOTED REDUNDANCY Interim Report
Daniel P. Siewiorek Oct. 1974 27 p refs
(Contract F44620-73-C-0074; ARPA Order 2466)
(AD-A004336; AFOSR-75-0061TR) Avail: NTIS CSCL 09/2

The classical reliability model for N-modular redundancy (NMR) assumes the network to be failed when a majority of modules which drive the same voter fail. It has long been known that this model is pessimistic since there are instances, termed compensating module failures, where a majority of the modules fail but the network is nonfailed. A different module reliability model based on lead reliability is proposed which has the classical NMR reliability model as a special case. Recent results from the area of test generation are employed to simplify the module reliability calculation under the lead reliability model. GRA

N75-26685# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF POSITION INPUT INTO A COMPUTER OF INFORMATION ABOUT A MACHINE-BUILDING PART
B. A. Podyakov 16 Dec. 1974 24 p refs Transl. into ENGLISH from the book "Vychislitelnaya tekhnika v mashinostroenii tekhnicheskoy kibernetiki" Minsk, AN BSSR, Dec. 1970 p 141-152
(AD-A004425; FTD-HC-23-2885-74) Avail: NTIS CSCL 09/2

A method of position coding, based on the operative agents of graphic information input(similar to a light pencil), is presented. Principles of spatial coding are discussed along with operational problems. M.J.S.

N75-26686# National Science Foundation, Washington, D.C. Office of Computing Activities.
COMPUTER ELEMENTS AND SYSTEMS, COLLECTED ARTICLES, VOLUME 44
N. G. Zagorujko 1974 147 p refs Transl. into ENGLISH from Vychislitelnye Sistemy, Sb. Trudov (Novosibirsk), v. 44, 1971
(TT-72-58026) Avail: NTIS HC $5.75 CSCL 09B

The outcome of investigationson pattern recognition methods and solutions to a number of recognition problems of an applied character are presented. Possible applications of the results include minimization of signal description, planning of experiments, and pattern and sound (speech) signal recognition. Author

N75-26687# Naval Research Lab., Washington, D.C.
PROGRAMMABLE CALCULATOR-MINICOMPUTER TRADE-OFFS
Kingsley P. Thompson Dec. 1974 48 p refs
(AD-A003456; NRL-MR-2938) Avail: NTIS CSCL 09/2

This thesis considers the tradeoffs involved in the selection of a computing device for general purpose tasks either on board a Naval vessel or at a shore installation. Three different means of computing are compared: type-one, a programmable algebraic calculator using a postfix notation; type-two, a programmable calculator using a BASIC language micro-programmed interpreter; and type-three, a minicomputer with software language interpreters and compilers. GRA

N75-26688# Michigan Univ., Ann Arbor. Dept. of Industrial and Operations Engineering.
ON THE IMPLEMENTATION OF A PHYSICAL DATA MODEL FOR TRANSLATION Interim Report
James P. Fry May 1974 25 p refs
(Grant AF-AFOSR-2219-72; AF Proj. 9769)
(AD-A003737; UMICH-Working-Paper-6.05; AFOSR-75-0036TR) Avail: NTIS CSCL 09/2

The central thesis of this paper is the development of a physical model for stored-data. To this end, the paper reports on the implementation of a physical data model for the University of Michigan Data Translator. First, the evolution of data models for translation is traced and the relevant literature is reviewed. In Section 3 the model is described using a top-down methodology. The basic design considerations are reviewed and the implementation details presented. This section also describes the utilization of the model in the translation process. Section 4 concludes the paper by presenting some observations on the implementation of physical data models for data translation. GRA

N75-26689# Michigan Univ., Ann Arbor. Dept. of Industrial and Operations Engineering.
TOWARDS A FORMULATION AND DEFINITION OF DATA REORGANIZATION
James P. Fry and David W. Jeris Jan. 1974 32 p refs
(Grant AF-AFOSR-2219-72; AF Proj. 9769)
(AD-A003738; AFOSR-75-0037TR) Avail: NTIS CSCL 09/2

Data reorganization can be informally defined as the process of changing the logical and/or physical organization of data so that it can be processed more effectively in a new hardware/software environment. Motivation for data reorganization is presented and examples given. The major issues that were taken into consideration in the formulation of a definition of data reorganization are discussed. These include the scope of the definition and issues of loss of information and data independence. A formal definition of data reorganization is presented and discussed through the use of a four level model of data. The spectrum of reorganization, from logical to physical, is discussed, and examples presented. Finally, the complexity of data reorganization operations is discussed. GRA

N75-26690# Army Electronics Command, Fort Monmouth, N.J.
A TACTICAL SYSTEM PROTOTYPE Final Report
Bernard J. Newman and Jerry A. Kastning Nov. 1974 61 p
(DA Proj. 1S7-63707-D-654)
(AD-A003839; ECOM-4279) Avail: NTIS CSCL 09/2

The following dissertation is on the computer integration and interfacing work done on the development of a tactical system prototype. The tactical system prototype includes a small scale militarized general purpose computer, a keyboard, thermal printer, and plasma alphanumeric display. GRA

N75-26691# Michigan Univ., Ann Arbor. Dept. of Industrial and Operations Engineering.
STORED DATA DEFINITION AND TRANSLATION APPROACH TO THE DATA PORT ABILITY PROBLEM
James P. Fry Feb. 1974 25 p refs
(Grant AF-AFOSR-2219-72; AF Proj. 9769)
(AD-A003736) Avail: NTIS CSCL 09/2

The data portability problem is the inability to move data from one system, which has inherently different characteristics in either architecture or software, to another. This problem is costing industry and government millions of dollars each year. One approach to this problem is termed data translation: the

process whereby data on one computer is changed into a form that is processable on the same computer with a different software system, or possibly a different computing system. The technical approach to data translation embodies the development of two declarative languages which describe stored-data and the transformations among stored-data and the implementation of a data translator which processes the stored-data. A Stored-Data Definition Language (SDDL) is being developed to declare the logical data structure and the physical encoding of its data instances for both the source and target files. A Translation Definition Language (TDL) is used to define how the target data instances are to be derived from the source data instances.
GRA

N75-26453 Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF COMPUTER PROCESSING OF TELEMETRIC DATA
Kh. N. Gaynanov, Yu. V. Neyman, and A. I. Rykov *In its* Meteorology and Hydrol., No. 3, 1975 (JPRS-65111) 30 Jun. 1975 p 136-150 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1975 p 105-113 (For availability see N75-26441 17-42)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-26692 Stanford Univ., Calif.
STRUCTURED DESCRIPTIONS OF COMPLEX CURVED OBJECTS FOR RECOGNITION AND VISUAL MEMORY Ph.D. Thesis
Ramakant Nevatia 1975 198 p
Avail: Univ. Microfilms Order No. 75-13563

The description and recognition were investigated of three dimensional, complex, curved objects by a computer. Programs were written to generate symbolic descriptions of objects and to recognize them by comparing with stored descriptions. One objective was to handle a potentially large class of objects (toy animals and hand-tools). Three dimensional position information about an object was obtained by a laser triangulation method. A complex object is described in terms of its subparts and composition of these parts. The individual parts are described by generalized cones, which are defined by a space curve known as the axis and arbitrary shaped normal cross-sections along this axis. The joints of parts are described by the relations of the parts joined together, and symbolic and structured graph-like descriptions are generated. Some descriptions use global information about the object. The symbolic description is compared with models stored in memory. Dissert. Abstr.

N75-26693*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A COMPUTER PROGRAM FOR FITTING SMOOTH SURFACES TO AN AIRCRAFT CONFIGURATION AND OTHER THREE DIMENSIONAL GEOMETRIES
Charlotte B. Craidon Washington Jun. 1975 112 p refs (NASA-TM-X-3206; L-9934) Avail: NTIS HC $5.25 CSCL 09B

A computer program that uses a three-dimensional geometric technique for fitting a smooth surface to the component parts of an aircraft configuration is presented. The resulting surface equations are useful in performing various kinds of calculations in which a three-dimensional mathematical description is necessary. Programs options may be used to compute information for three-view and orthographic projections of the configuration as well as cross-section plots at any orientation through the configuration. The aircraft geometry input section of the program may be easily replaced with a surface point description in a different form so that the program could be of use for any three-dimensional surface equations. Author

N75-26694# Air Force Human Resources Lab., Brooks AFB, Tex.
CODAP: SOURCE PROGRAM LISTINGS FOR THE UNIVAC 1108 Interim Report, Jan. 1973 - Sep. 1974
Johnny J. Weissmuller, Bruce B. Barton, and C. R. Rogers Oct. 1974 535 p refs
(AF Proj. 7734)
(AD-A004084; AFHRL-TR-74-83) Avail: NTIS CSCL 09/2

The Comprehensive Occupational Data Analysis Programs (CODAP) package is a highly interactive and efficient system of computer routines for analyzing, organizing, and reporting occupational information. Since its inception in 1960, CODAP has grown in tandem with advances in job analysis methodology and is now capable of answering most of the wide variety of management questions which confront CODAP users. This documentation of the UNIVAC 1108 CODAP system is being published in a series of 3 technical reports covering the control card and programming aspects of the system. A fourth report is in preparation by the Occupational Research Division of AFHRL which covers the research and operational applications of the CODAP system. This document contains the source programs for the UNIVAC 1108 version of CODAP. This includes 34 FORTRAN main programs, 78 FORTRAN and 20 Assembly Language subroutines. Additionally, a table of contents, an introduction, an entry point table, and an index are provided.
GRA

N75-26695# Technische Universitaet, Munich (West Germany).
RELIABLE DECODING: A NEW DECODING PROCEDURE FOR PRODUCT CODES Ph.D. Thesis [ZUVERLAESSIGKEITSDECODIERUNG: EIN NEWES DECODIERVERFAHREN FUER PRODUKTCODES]
Eligius Vancek 21 Feb. 1974 170 p refs In GERMAN
Avail: NTIS HC $6.25

A step decoding procedure for two dimensional product codes is reported that prevents erroneous decisions through forward testing of proposed corrections for their reliability. Iteration of reliability decoding in two dimensional product codes is only limited by the capacity of the partial decoder. Transl. by G.G.

N75-26696# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
REPORT ON THE RESEARCH PROJECT 'MODELS FOR AN INTERMACHINE COMPILER' [BERICHT UEBER DAS FORSCHUNGSVORHABEN "MODELLE FUER EINEN INTERMASCHINELLEN COMPILER"]
Lutz Schuberth Apr. 1974 71 p refs In GERMAN; ENGLISH summary
(Rept-220) Avail: NTIS HC $4.25

A review is presented of research activities on the modelling of an intermachine compiler during the last five years. The actual model, methods, and results of this activity is reported and compared with other work done in the field. ESRO

N75-26697# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
INVESTIGATION ON INDEX-SEQUENTIAL SEARCH METHODS [UNTERSUCHUNG INDEX-SEQUENTIELLER SUCHMETHODEN]
Lutz Eberhard May 1974 39 p refs In GERMAN; ENGLISH summary
(Rept-221) Avail: NTIS HC $3.75

Possible methods of accelerating index-sequential searching were investigated. Modifications of these methods are limited to the structure of the record sets and the choice of the starting element, which determines the start of the index-sequential method. The methods resulting from changing the geometric structure of the record sets (rectangle and triangle) are investigated and compared with regard to search effectiveness. Accelerated methods are determined depending on the choice of the start element. ESRO

N75-26698# Stanford Univ., Calif. Dept. of Computer Science.
AL, A PROGRAMMING SYSTEM FOR AUTOMATION
Raphael Finkel, Russel Taylor, Robert Bolles, Richard Paul, and Jerome Feldman Nov. 1974 140 p
(Contract DAHC15-73-C-0435; Grant NSF GI-42906)
(AD-A003815; SU-STAN-CS-74-456; SU-AIM-243) Avail: NTIS CSCL 09/2

AL is an high-level programming system for specification of

manipulatory tasks such as assembly of an object from parts. AL includes an ALGOL-like source language, a translator for converting programs into runnable code, and a runtime system for controlling manipulators and other devices. The system includes advanced features for describing individual motions of manipulators, for using sensory information, and for describing assembly algorithms in terms of common domain-specific primitives. This document describes the design of AL, which is currently being implemented as a successor to the Stanford WAVE system. GRA

N75-26699# Massachusetts Inst. of Tech., Cambridge.
THE BCPL REFERENCE MANUAL
Martin Richards, Arthur Evans, Jr., and Robert F. Mabee Dec. 1974 56 p refs
(Contract N00014-70-A-0362-0006; ARPA Order 2095; Proj. MAC)
(AD-A003599; MAC-TR-141) Avail: NTIS CSCL 09/2

BCPL is a language which is readable and easy to learn, as well as admitting an efficient compiler capable of generating efficient code. It is made self consistent and easy to define accurately by an underlying structure based on a simple idealized object machine. The treatment of data types is unusual and it allows the power and convenience of a language with dynamically varying types and yet the efficiency of FORTRAN. BCPL has been used successfully to implement a number of languages and has proved to be a useful tool for compiler writing. The BCPL compiler itself is written in BCPL and has been designed to be easy to transfer to other machines; it has already been transferred to more than ten different systems. GRA

N75-26700# Naval Ship Research and Development Center, Bethesda, Md.
A SYSTEM FOR RELIABLE ENGINEERING SOFTWARE
L. M. Culpepper Nov. 1974 14 p refs
(AD-A003465; NSRDC-4588) Avail: NTIS CSCL 09/2

A Software System (AUDIT) has been developed to examine contractor-produced computer programs for compliance with prescribed standards of programming form and style and to facilitate study of the output behavior of a program as a function of computer word length. AUDIT is coded in FORTRAN 4 and is operational on the CDC 6000, UNIVAC 1108, and IBM 360 computers. GRA

N75-26701# California Univ., Berkeley. Operations Research Center.
APPROXIMATION OF OPTIMAL SOLUTION FOR INFINITE HORIZON LINEAR PROGRAMS
Richard C. Grinold Dec. 1974 37 p refs
(Contract N00014-69-A-0200-1055; NR Proj. 047-120)
(AD-A003558; ORC-74-35) Avail: NTIS CSCL 12/2

This paper defines infinite horizon linear programs and presents a procedure that will approximate the optimal solution of almost any infinite horizon linear program that has a finite optimal value. In addition, it is demonstrated that other procedures for calculating optimal solutions will not, in general, approximate the optimal solution. GRA

N75-26702# International Business Machines Corp., Owego, N.Y. Electronics Systems Center.
MCU I/O CHANNEL INVESTIGATION Final Report, 1 Aug. 1973 - 6 Jan. 1975
G. Tabacchi and W. Young Jan. 1975 49 p refs
(Contract N00014-73-C-0518)
(AD-A003581; IBM-75-559-001) Avail: NTIS CSCL 09/2

The primary objectives of the investigation were to perform the following four tasks: (1) Define the functional transfer functions for the following device and channels - IBM model 2314 disc drive controller; IBM system 360/370 channels; and, NTDS parallel and serial channels as analyzed by IBM ASC. This also included the IOA and IOA-E: (2) Prepare MCU micro-code, written in AMIL, to emulate the functional transfer functions defined under Task 1; (3) Define modeling statistics to assay performance of the MCU in emulating each of the transfer functions; (4) Perform emulation of the functional transfer functions to determine the performance and feasibility of attaching to the MCU. GRA

N75-26703# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A MACHINE PROGRAMMING METHOD FOR THE EXPANSION OF THE OPERATIONAL MEMORY OF THE ELECTRONIC DIGITAL COMPUTER (ETsVM) MINSK 22
20 Nov. 1974 15 p Transl. into ENGLISH from the book "Vychislitelnaya tekhnika v mashinostroenii. Teknicheskoi kibernetiki" Minsk, Dec. 1970 p 135-140
(AD-A003811; FTD-HC-23-2884-74) Avail: NTIS CSCL 09/2

For effective utilization of a digital computer in information input and output processes, a buffer storage providing coordination with communication channels is presented in the form of an algorithm. Other topics discussed include magnetic storage, data transmission, storage tapes, block diagrams, and flip-flops. M.J.S.

N75-26704# IBM Watson Research Center, Yorktown Heights, N.Y.
PROGRAMMING IN NATURAL ENGLISH Interim Technical Report
Lance A. Miller and Curtis A. Becker 15 Nov. 1974 59 p refs
(Contract N00014-72-C-0419; NR Proj. 197-020)
(AD-A003923; RC-5137) Avail: NTIS CSCL 09/2

College students were asked to type detailed specifications of procedures in their natural language (English) as solutions for a set of six file manipulation problems. The language productions were examined from the points of view of solution correctness, preferences of expression, contextual referencing, word usage, and formal programming languages. GRA

N75-26705# Texas A&M Univ., College Station.
ALGORITHM FOR THE COMPUTATION OF THE COEFFICIENTS OF POWERS OF POLYNOMIALS Progress Report
G. Chen and H. O. Hartley Dec. 1974 85 p refs
(Contract N00014-68-A-0140; NR Proj. 047-700)
(AD-A003594; TR-49) Avail: NTIS CSCL 12/2

One of the approaches to determine the global maximum of a multivariate function f(x) within a 'feasible region' R in the Euclidean n-space is based on the evaluation of the so-called functional moments of f(x). Algorithms accomplishing this task in three special cases were investigated. The first case arises when f(x) is a multivariate polynomial and R is the n dimensional hypercube. In the second case, f(x) is a multivariate expansion into trigonometric functions and region R is the hypercube. A third case is considered where f(x) is given by a multivariate polar expansion and r is a smooth convex region in the sense that the distance from an origin in the interior of R to the boundary is a low degree trigonometric expansion in the space angles. GRA

N75-26706# Aerospace Corp., El Segundo, Calif.
CAN SOFTWARE BENEFIT FROM HARDWARE RELIABILITY EXPERIENCE
H. Hecht 13 Jan. 1975 22 p refs
(Contract F04701-74-C-0075)
(AD-A004076; TR-0075(5112)-4; SAMSO-TR-75-6) Avail: NTIS CSCL 09/2

The question posed in the title is answered with a qualified yes. While software requires a completely different attack on failure mechanisms than is used for hardware, there is considerable commonality in reliability organization and procedures, and some in the systems reliability area. The present lack of a generally accepted metric for software reliability impedes the information transfer from the hardware field. Steps towards a quantitative measure for software reliability are outlined. GRA

N75-26707# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
AN ACCELERATED MULTIPLIER METHOD FOR NONLINEAR PROGRAMMING
J. T. Betts 30 Nov. 1974 76 p refs
(Contract F04701-74-C-0075)
(AD-A004077; TR-0075(5901-03)-5; SAMSO-TR-75-12) Avail: NTIS CSCL 12/2

This report describes an accelerated multiplier method for solving the general nonlinear programming problem. The algorithm

poses a sequence of unconstrained optimization problems. The unconstrained problems are solved using a rank-one recursive algorithm described in an earlier paper. Multiplier estimates are obtained by minimizing the error in the Kuhn-Tucker conditions using a quadratic programming algorithm. The convergence of the sequence of unconstrained problems is accelerated by using a Newton-Raphson extrapolation process. The numerical effectiveness of the algorithm is demonstrated on a relatively large set of test problems. GRA

N75-26708# Aerospace Corp., El Segundo, Calif.
TEST TOOLS: ARE THEY A CURE-ALL? Interim Report
Donald J. Reifer and Robert Lee Ettenger 15 Oct. 1974 31 p refs
(Contract F04701-74-C-0075)
(AD-A004078; TR-0075(5112)-5; SAMSO-TR-75-13) Avail: NTIS CSCL 09/2

There has been a concentrated effort by some members of the aerospace industry to reduce the cost of testing computer programs. These efforts have primarily been aimed at developing support software systems which do a structural analysis of instrumented higher order language source programs. The systems available today process either FORTRAN or JOVIAL source code. A critical evaluation of four of these systems was undertaken to analyze their potential cost effectiveness. This examination was from a critical standpoint because it attempts to examine the potential of such systems to solve the testing problem. The conclusions contain the author's recommendations for future developments. GRA

N75-26709# Numerical Control Society, Inc., Spring Lake, N.J.
NUMERICAL CONTROL LANGUAGE EVALUATION Final Report, 16 Oct. 1972 - 31 Mar. 1974
Peter D. Senkiw, James J. Childs, Joseph Harrington, Jr., and William H. White 31 Mar. 1974 630 p refs
(Contract DAAB07-73-C-0058)
(AD-A004040; ECOM-0058-F-73) Avail: NTIS CSCL 09/2

An examination of seven numerical control programming languages was conducted to characterize them qualitatively and quantitatively. The purpose was to present data on the basis of which a potential user can make an expeditious, cost effective selection of a programming language. The report presents a description of each language and processor including: The proponent organization, the organization of the language and processor and procedures for their use, and an illustrative program of a simple part programmed in each language. Application characteristics--capability, availability, computer hardware requirements, implementation and typical costs and, a check list of various geometric element formats recognized by the processor. GRA

N75-26710# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
THE PROGRAMMABLE STRATEGY THEOREM PROVER: AN IMPLEMENTATION OF THE LINEAR MESON PROCEDURE Interim Report
Mark E. Stickel Jun. 1974 66 p refs
(Contract F44620-73-C-0074; ARPA Order 2466)
(AD-A004474; AFOSR-75-0133TR) Avail: NTIS CSCL 09/2

The Programmable Strategy Theorem Prover (PSTP) is a theorem proving program for the first order predicate calculus using the linear MESON procedure as the inference system. The linear MESON procedure is a new variant of the model elimination theorem proving procedure for theories with or without equality which is an affirmation rather than a refutation procedure. It is profitably viewed as an extension of the problem-reduction method. The fundamental element of a linear MESON procedure deduction, the chain, is a representation of a set of goals to be solved and their supergoals. GRA

N75-26711# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
A SURVEY OF SOME ISSUES CONCERNING ABSTRACT DATA TYPES Interim Report
Lawrence Flon Sep. 1974 49 p refs
(Contract F44620-73-C-0074; Grant NSF GJ-32259; ARPA Order 2466)
(AD-A004337; AFOSR-75-0136TR) Avail: NTIS CSCL 09/2

The author attempts in this survey to define the notion of abstract data type and discusses several important issues related to their use in high level languages, including encapsulation, exportation, parameterization, pointers, extent, coercion, assignment, initialization, and literals. The programming languages Algol 68, Simula 67, and PASCAL are chosen as a representative set of type-extendable languages and are compared and contrasted as to their treatment of these issues. Proposals for new languages or facilities made by Liskov, Wulf, and Morris are included in the discussion. GRA

N75-26712# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
EVALUATION OF INSTRUCTION SET PROCESSOR ARCHITECTURE BY PROGRAM TRACING Ph.D. Thesis
Almund Lunde Jul. 1974 208 p refs
(Contract F44620-73-C-0074; ARPA Order 2466)
(AD-A004824; AFOSR-75-0184TR) Avail: NTIS CSCL 09/2

The thesis develops and evaluates methods for evaluation of the architecture of instruction set processors (ISPs). (An ISP is the logical processor defined by the instruction set, independent of physical implementation). The methods are based on analyzing traces of program executions which contain information about every instruction executed. The main advantages of the methods are: They permit a very detailed study of ISP behavior; they are not restricted to specific languages or processors; and, they are easily programmed. GRA

N75-26713# Air Force Systems Command, Washington, D.C.
PROCEEDINGS OF THE AERONAUTICAL SYSTEMS SOFTWARE WORKSHOP
John H. Manley and W. Robert Archibald 1 Jul. 1974 466 p refs Conference held at Dayton, Ohio, 2-4 Apr. 1974
(AD-A004547) Avail: NTIS CSCL 09/2

A Workshop on Aeronautical Systems Software was held in April 1974 under the sponsorship of Headquarters Air Force Systems Command. The objectives of the workshop were to: (1) determine the state-of-the-art in the development of aeronautical systems software; (2) identify the major problems in this area; and (3) offer potential solutions to these problems. Participants were invited from the Department of Defense, civilian industry and aerospace research activities. Over 350 persons participated. A total of seven invited and 60 contributed papers were presented as opening positions for subsequent discussion. Summaries of these papers as well as the papers themselves are contained in the proceedings. GRA

N75-26714# Naval Research Lab., Washington, D.C. Mathematics Research Center.
LINEAR INTEGER PROGRAMMING Interim Report
James J. Swanek 31 Dec. 1974 47 p refs
(NRL Proj. B01-11; RR0140241)
(AD-A003906; NRL-7797; Rept-74-1) Avail: NTIS CSCL 12/2

Some of the mathematical aspects of the group theoretic approach to linear integer programs were analyzed. The manner in which an Abelian group is associated with a linear integer program has been analyzed. Corresponding to each linear integer program is an associated polyhedron. The geometric structure of this polyhedron reflects the structure of the linear integer program. If the polyhedron is known, then under appropriate conditions the optimal solution of the integer program is known. Some properties of these Abelian polyhedra, associated with Abelian groups, are discussed. A computer implementation of the group theoretic approach is included in the report. GRA

N75-26715# Air Force Human Resources Lab., Brooks AFB, Tex.
CODAP: PROGRAMMER NOTES FOR THE SUBROUTINE LIBRARY ON THE UNIVAC 1108 Interim Report, Jan. 1973 - Sep. 1974
Johnny J. Weissmuller, Bruce B. Barton, and C. R. Rogers Oct. 1974 181 p
(AF Proj. 7734)
(AD-A004086; AFHRL-TR-74-85) Avail: NTIS CSCL 09/2

This document contains programmer notes on 100 library subroutines used by the current UNIVAC 1108 version of CODAP. GRA

N75-26716# Air Force Human Resources Lab., Brooks AFB, Tex.
CODAP: CONTROL CARD SPECIFICATIONS FOR UNIVAC 1108 Interim Report, Jan. 1973 - Sep. 1974
William D. Stacy, Johnny J. Weissmuller, Bruce B. Barton, and C. R. Rogers Oct. 1974 204 p
(AF Proj. 7734)
(AD-A004085; AFHRL-TR-74-84) Avail: NTIS CSCL 09/2

This document contains control card writeups for the 34 main programs in the UNIVAC 1108 version of CODAP. GRA

N75-26717# Maryland Univ., College Park. Computer Science Center.
THE ECONOMICAL STORAGE OF PLANE ROTATIONS
G. W. Stewart Nov. 1974 11 p refs
(Contract N00014-67-A-0239-0037)
(AD-A004632; TR-342) Avail: NTIS CSCL 09/2

The object of this note is to describe how plane rotations can be economically represented on a computer. Plane rotations, which have long been used in matrix computations to annihilate selected elements of a matrix, have the drawback that their definition requires two numbers. In this note it is shown how this information may be stably compacted into a single number. An appendix lists FORTRAN programs for solving linear equations which illustrate the technique described in the body of the note. GRA

N75-26718# National Institutes of Health, Bethesda, Md.
CONVERSATIONAL RMAG21
Robert A. Magnuson Feb. 1975 34 p refs
(PB-240115/6; NIH-DCRT-DMB-SSS-AN502) Avail: NTIS HC $3.75 CSCL 09B

This applications note describes MANAGER, a Recursive Macro Actuator Generator, version 21 (RMAG21) program which supervises the user as he programs RMAG interactively under TSO. Using it, a beginner can experiment with both RMAG and RMAGLIB. An RMAG programmer can design, code, debug, or modify an RMAG routine, and then save the code on a disk file. At a later MANAGER session the saved code can be read back in. With MANAGER the RMAG language can be learned at the terminal, and MANAGER contains a powerful macroeditor and the ability to debug via breakpoints and tracebacks. The RMAG21 is used for the generation of source language code, data, text, and arbitrary strings. A stand-alone macroprocessor, RMAG21 is used to generate source coding for virtually any computer language. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N75-26719 Stanford Univ., Calif.
COMPUTER ORGANIZATION AND ALGORITHMS FOR VERY-HIGH SPEED COMPUTATIONS Ph.D. Thesis
Samuel Ellis Orcutt, Jr. 1975 122 p
Avail: Univ. Microfilms Order No. 75-13572

Three separate but related problems in very high-speed computation are discussed. The first of these is the performing of data interchanges in a parallel computer similar to the ILLIAC IV. Specific algorithms are presented for bit reversal and perfect shuffle permutations along with a general algorithm, suitable for a wide variety of permutations. The problem of developing new parallel algorithms and the particular problem of the solution to triangular linear systems of equations are discussed. The development of parallel computer architectures was studied by considering the formulation of matrix products and developing a machine architecture that allows the computation of these products in O(log N) steps. Dissert. Abstr.

N75-26720# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany). Abteilung fuer Behoerdliche DV-Systeme.
STRUCTURE AND EFFICIENCY OF DATA BANK SYSTEMS: COLLECTION AND ANALYSIS OF USER REQUIREMENTS [STRUKTUR UND LEISTUNGSUMFANG VON DATENBANKSYSTEMEN. SAMMLUNG UND ANALYSE VON BENUTZERVORSTELLUNGEN]
K. Supper Mar. 1974 157 p refs In GERMAN
Avail: NTIS HC $6.25

A survey was conducted of user requirements with regard to data bank systems. A questionnaire was developed based on existing systems, and about 100 were sent to present or potential users of data banks. Replies were received from 50% of the addresses (most of them government authorities), and an evaluation of the requirements is presented, classified as follows: a total data bank system, a pure data base management system, an extended data base management system, and a documentation system. ESRO

N75-26721# California Univ., Los Angeles. School of Management.
COMPUTER PERFORMANCE EVALUATION Annual Report, 1 Jan. - 31 Dec. 1974
Bennet P. Lientz Dec. 1974 9 p
(Contract N00014-69-A-0200-4053; NR Proj. 049-345)
(AD-A003610) Avail: NTIS CSCL 09/2

Research on computer performance evaluation is reported. Reports are presented on the following topics: computer network usage and cost benefit analyses; some statistical estimation problems relating to communication message reliability; experiments in communication networks; guidelines for the acquisition of software packages; system evaluation techniques for error detection; and the evaluation of reliability and security measures in a network. GRA

N75-26722# Aerospace Corp., El Segundo, Calif.
A STRUCTURED APPROACH TO MODELING COMPUTER SYSTEMS Final Report, Jan. 1973 - Jan. 1974
D. J. Reifer 30 Aug. 1974 20 p refs
(Contract F04701-74-C-0075)
(AD-A004075; TR-0075(5112)-2; SAMSO-TR-75-3) Avail: NTIS CSCL 09/2

The application of a structured approach to modeling computer systems is discussed. Variations to the theories of Dijkstra and Mills are adapted to develop guidelines for structuring complex modeling activities. The structure employs multiple levels and concerns itself with control and interface rules for both hardware and software elements. The concepts of representative modeling, structured programming, and levels of abstraction are incorporated into a method in which control interfaces are prescribed in a logical and flexible manner. The guidelines have been used for a number of simulation projects. GRA

N75-26723# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
SOME OBSERVATIONS ON MODULAR DESIGN TECHNOLOGY AND THE USE OF MICROPROGRAMMING
D. P. Siewiorek and M. R. Barbacci Jul. 1974 27 p refs
(Contract F44620-73-C-0074; Grant NSF GJ-32758)
(AD-A004093; AFOSR-75-0065TR) Avail: NTIS CSCL 09/2

As modules become more complex the advantages and disadvantages of modularity have become more pronounced. The cost of modularity is measured not only in added hardware but also in a loss of flexibility. Functions that are easy to implement at a submodule level may be very difficult, or even impossible, to duplicate at the modular level. The authors term this a loss of transparency. The added hardware and transparency costs are given for existing module sets and projections made for the next generation of modules. Finally, a microprogrammed implementation of the control portion of existing and projected module sets is shown to be a way to decrease hardware costs and increase transparency. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N75-26724 Georgia Inst. of Tech., Atlanta.
SOME APPLICATIONS OF GENERALIZED INVERSE TO PATTERN RECOGNITION Ph.D. Thesis

Mohamad Adnan Al-Alaoui 1974 111 p
Avail: Univ. Microfilms Order No. 75-12997

The concepts and techniques of the generalized inverse were applied to mean-square-error (MSE) problems in pattern recognition. The aim is to keep the attractive features of the MSE approach and to combat its deficiencies, utilizing the attractive formulation of the generalized inverse. The scope is restricted to the case where the underlying probability densities of the different classes are unknown. Results include: (1) introducing a new weighted MSE procedure for pattern classification and motivating the approach statistically; (2) three theorems on redundancy and the least-square generalized inverse solution for an inconsistent set of equations are presented and proved; (3) introducing a new algorithm for pattern classification together with a convergence proof for the linearly separable case; (4) introducing an adaptive constrained MSE procedure for pattern classification; (5) suggesting a problem-oriented clustering technique, and (6) pointing out the relation between the generalized inverse, Fourier and Karhunen-Loeve expansions.
Dissert. Abstr.

N75-26725 Oregon State Univ., Corvallis.
PATTERN RECOGNITION OF SPEECH USING HYBRID COMPUTER FEATURE EXTRACTION Ph.D. Thesis
Alan Jack Herr 1975 448 p
Avail: Univ. Microfilms Order No. 75-13058

A viable solution is presented of the problem of real time machine determination of the information content of human speech. This system is capable of determining the information content present in human utterances with a greater degree of accuracy than a human listener can perceive speech, disregarding contextual information. Also, human voice perception is not limited by noise masking to the extent exhibited by the human ear. Operationally, the real time, hybrid computer system first estimates the model parameters of the human speech generation mechanism from phonetic features extracted from the speech waveform. The system next is able to deterministically relate the estimates of the human's speech generation model parameters to the phonemes (the information content) present in the human's vocal utterance. The speech recognition process is a multi-level process directly analogous to the multi-level speech recognition method used by a human listener. Dissert. Abstr.

N75-26726# North Carolina Univ., Chapel Hill.
ACHIEVING SPECIFIED ACCURACY IN SIMULATION OUTPUT ANALYSIS
George S. Fishman Dec. 1974 20 p refs
(Contract N00014-67-A-0321-0008; NR Proj. 047-139)
(AD-A003556; TR-74-4) Avail: NTIS CSCL 12/2

This paper extends the use of the regenerative property of queueing systems in the analysis of simulation output. In particular, it describes a sequential estimation method which when used with the regenerative property allows results to be obtained with specified statistical accuracy. This method includes a test to check the normality assumption on which the sequential procedure relies. The paper illustrates the method using the empty and idle state as the regenerative states. A second example then describes how using the most frequently entered state as the regenerative state reduces the chance of making a costly error in a preliminary simulation run. The paper also describes how a variance reduction method can be used to obtain a specified accuracy with considerably fewer job completions than are rzquired when no variance reduction technique is applied. GRA

N75-26727# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
APPLICATIONS OF INFORMATION SYSTEM THEORY TO AIR FORCE PROBLEMS IN COMMUNICATIONS AND DATA HANDLING Interim Report, 1 Sep. 1973 - 31 Aug. 1974
J. K. Wolf Aug. 1974 65 p refs
(Grant AF-AFOSR-2601-74; AF Proj. 9749)
(AD-A004172; AFOSR-75-0082TR) Avail: NTIS CSCL 09/4

This report summarizes the results of research performed under grant for the period 1 September 1973 through 31 August 1974. The research was concerned with problems in communications theory and information theory and their applications. Specific problems considered were the reduction of data for multiple correlated sources and applications of detection, estimation and information theoretic techniques to Air Force problems in automated technical control for digital communication links.
GRA

N75-26728# Naval Electronics Lab. Center, San Diego, Calif.
INFORMATION SYSTEM THEORY Final Report, 1 Jul. 1972 - 1 Jul. 1974
J. C. Tiernan and K. Kaufmann 22 Jul. 1974 202 p refs
(NELC Proj. N438; XR02105001)
(AD-A003896; NELC/TD-355) Avail: NTIS CSCL 09/4

Energy distribution giving the greatest rate performance, was numerically determined for the first-order autoregressive channel with noiseless feedback when a center-of-gravity processor was used. Determination was made during investigation on communication systems with potential Navy application. A powerful nonlinear programming computer program, using a new algorithm was developed to solve constrained nonlinear problems. GRA

N75-26729# Stanford Univ., Calif. Dept. of Computer Science.
STRUCTURED DESCRIPTIONS OF COMPLEX CURVED OBJECTS FOR RECOGNITION AND VISUAL MEMORY
Ramakant Nevatia Oct. 1974 128 p refs
(Contract DAHC15-73-C-0435; ARPA Order 2494)
(AD-A003486; SU-STAN-CS-74-464) Avail: NTIS CSCL 09/2

Description and recognition of three-dimensional objects from range data obtained by a laser triangulation technique are described. A complex object is described by decomposition into sub-parts and relations of these sub-parts. The individual parts are described by generalized cones, which are defined by a space curve known as the axis, and arbitrary shaped normal cross-sections along this axis. Techniques for segmenting an object into sub-parts and generating structured, symbolic, graph like descriptions are described. These symbolic descriptions are matched with stored descriptions and the best match is picked for recognition. A limited amount of indexing capability exists to efficiently retrieve a sub-class of similar objects from the models stored in the memory. Indexing is a necessity if a large number of visual models is to be used. GRA

N75-26730# Naval Postgraduate School, Monterey, Calif.
OPTIMAL DESIGN OF OBSERVER/CONTROLLERS M.S. Thesis
Robert Ernest LaRock Dec. 1974 111 p refs
(AD-A003785) Avail: NTIS CSCL 12/1

A new technique for full-order and reduced-order observer design which is based on the minimization of an integral square-error performance measure is developed for the integral of time-multiplied-square-error performance measure. The technique is extended to include the design of full-order and reduced-order combined observer/controllers. The technique is well suited to the design of higher order, multiple-input, multiple-output systems where traditional methods become difficult to apply. GRA

N75-26731# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Computer Engineering.
PATTERN RECOGNITION FOR THE AUTOMATIC REDUCTION OF RECONNAISSANCE DATA Final Report
Ranan B. Banerji and George W. Ernst 1 Nov. 1974 29 p refs
(Grant AF-AFOSR-2110-71)
(AD-A004175; AFOSR-75-0123TR) Avail: NTIS CSCL 09/2

Three specific projects were undertaken during this contract. (1) The investigation of the generalization capability of patterns learned by linear, piecewise linear, and quadratic discriminant functions, (2) The development of a deductive information retrieval system based on a pattern recognition language previously developed, and (3) The investigation of feature extraction techniques in algebraic and interpreted linguistic pattern description languages. A separate section of this report is devoted to each of these three projects. GRA

N75-26732# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
NOTES ON DECISION AND CONTROL 3
Y. C. Ho, I. Blau, T. Baser, and G. Hexner Nov. 1974 29 p refs

(Contract N00014-67-A-0298-0006; Grant NSF GK-31511; NR Proj. 372-012)
(AD-A003916; TR-657) Avail: NTIS CSCL 12/2

Certain results arising in many person optimization problems under different information structures are discussed. It is shown that in some multiple decision maker problems, one or more of the decision makers may ignore seemingly useful information. Author (GRA)

N75-26733# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
ACQUISITION OF CARRIER AND TIMING DATA-1
L. E. Franks 1974 21 p refs Presented at NATO Advanced Study Inst. on New Direc. in Signal Process. in Commun. and Control, Darlington, England, 15-17 Aug. 1974
(Grant AF-AFOSR-2111-71)
(AD-A003739; AFOSR-75-0014TR) Avail: NTIS CSCL 09/4

The author examines two basically different approaches to phase and timing recovery problems by means of ML estimation. In one approach, an attempt is made to recover the unknown parameters without reference to any information about the data signal. In the other approach, generally called a data-aided approach the author obtains superior performance by taking advantage of whatever is known at the receiver about the transmitted data signal. A comparison of the performance of these two approaches gives valuable information about what type of recovery scheme should be employed for specific signal formats. GRA

N75-26734# Maryland Univ., College Park. Computer Science Center.
PICTURE RECOGNITION
Azriel Rosenfeld and Joan S. Weszka Dec. 1974 77 p refs
(Contract N00014-67-A-0239-0012)
(AD-A004633; TR-344) Avail: NTIS CSCL 09/2

The report reviews methods of measuring properties of pictures, and extracting objects from pictures, for purposes of picture recognition and description. Topics covered include: Properties of regions in pictures -- in particular, textural properties; detection of objects in pictures - template matching, edge detection; properties of detected objects -- projections, cross-sections, moments; object extraction -- thresholding, region growing, tracking; properties of extracted objects -- connectedness and counting, area and perimeter, compactness, convexity, elongatedness; and, object and picture representation -- boundaries, skeletons, relational structures. GRA

N75-26735# Washington Univ., St. Louis, Mo. Control Systems Science and Engineering.
CONTROL, GUIDANCE, AND INFORMATION FUNDAMENTALS OF AEROSPACE Final Report
John Zaborszky 1 Sep. 1974 29 p refs
(Contract F44620-69-C-0116; AF Proj. 9749)
(AD-A003699; AFOSR-74-1919TR) Avail: NTIS CSCL 09/4

The report describes in some detail the papers completed and published under the contract as well as work partially completed at the end of the contract period. This report lists the titles of 67 research papers completed during the period and 20 theses prepared by PhD candidates. The report contains research results in filtering theory, control and information theory. GRA

N75-26736# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
COMPUTER RECOGNITION OF FACIAL PROFILES M.S. Thesis
Gerald J. Kaufman Aug. 1974 152 p refs
(Grant AF-AFOSR-2048-71; AF Proj. 9769)
(AD-A004159; AFOSR-75-0074TR) Avail: NTIS CSCL 09/2

A system for the recognition of human faces from full profile silhouettes is described. The system is adaptively trained using a novel stack-oriented training procedure which is shown to be quite effective in identifying those feature vectors which are of most importance in the recognition process. Thus the training procedure generally produces authority files having a small number of entries. The feature vectors used are generated from a normalized autocorrelation function expressed in polar coordinates. These feature vectors are shown to be more effective in the recognition process than are the moment invariant features, at least for this problem. Experiments are described in which the system attains a recognition accuracy of 90% in a 10 class problem using 12-dimensional circular autocorrelation feature vectors. It is shown, by further experiments, that these results are no worse than a human observer's accuracy. GRA

N75-26737# Agbabian Associates, El Segundo, Calif.
DEVELOPMENT AND TESTING OF METHODS BASED ON MULTIVARIATE STATISTICS AND SIGNAL PROCESSING FOR COMPACTION OF LARGE SETS OF SCIENTIFIC MEASUREMENT DATA Final Report, Jun. 1973 - Jun. 1974
Robert K. Otnes, Loren Enochson, and N. Roy Goodman Aug. 1974 63 p refs
(Contract F19628-73-C-0301; AF Proj. 6813)
(AD-A003705; AA-R-7340-3501; AFCRL-TR-74-0395) Avail: NTIS CSCL 09/2

An investigation of data compaction methods based on techniques for multivariate statistics, time series analysis and coding theory is described. The data are multichannel signature-type data collected in the course of large-scale scientific experiments. Several advanced reduction techniques were applied and tested on data consisting of three physical measurement channels plus ephemeris information from the Injun V Satellite. The data occupy 1800 reels of 2400-ft tape, providing considerable motivation to determine suitable compaction methods. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-26738 Polish Academy of Sciences, Warsaw.
APPLICATION OF PARAMETRIC DIFFERENTIAL EQUATIONS IN MECHANICS AND ENGINEERING TECHNOLOGY [ZASTOSOWANIA PARAMETRYCZNYCH ROWNAN ROZNICZKOWYCH W MECHANICE I TECHNICE]
Wanda Szemplinska-Stupnicka 3 Jan. 1975 60 p refs In POLISH
Avail: Issuing Activity

Parametric oscillations are discussed of systems whose accepted models are discrete and are described by using ordinary differential equations. This includes both those systems found in the dynamics of machines vibrating with variable periodic coefficients of rigidity and inertia, and problems concerning motion stability. The stability was investigated of the equilibrium position of elastic bodies loaded with forces periodically changing in time (dynamic structural stability problems). A physical model of the system is described, and equations are derived using elastic deformation and the Galerkin method. Transl. by M.J.S.

N75-26739*# Texas A&M Univ., College Station. Dept. of Mathematics.
LFSPMC: LINEAR FEATURE SELECTION PROGRAM USING THE PROBABILITY OF MISCLASSIFICATION
L. F. Guseman, Jr. and Bruce P. Marion Jan. 1975 52 p refs
(Contract NAS9-13894)
(NASA-CR-141878; Rept-3) Avail: NTIS HC $4.25 CSCL 12A

The computational procedure and associated computer program for a linear feature selection technique are presented. The technique assumes that: a finite number, m, of classes exists; each class is described by an n-dimensional multivariate normal density function of its measurement vectors; the mean vector and covariance matrix for each density function are known (or can be estimated); and the a priori probability for each class is known. The technique produces a single linear combination of the original measurements which minimizes the one-dimensional probability of misclassification defined by the transformed densities. Author

N75-26740*# Houston Univ., Tex. Dept. of Mathematics.
MAXIMUM LIKELIHOOD SIGNATURE ESTIMATION
Homer F. Walker Apr. 1975 10 p refs
(Contract NAS9-12777)
(NASA-CR-141882; Rept-42) Avail: NTIS HC $3.25 CSCL 12A

Maximum-likelihood estimates are discussed which are based on an unlabeled sample of observations, of unknown parameters in a mixture of normal distributions. Several successive approximation procedures for obtaining such maximum-likelihood estimates are described. These procedures, which are theoretically justified by the local contractibility of certain maps, are designed to take advantage of good initial estimates of the unknown parameters. They can be applied to the signature extension problem, in which good initial estimates of the unknown parameters are obtained from segments which are geographically near the segments from which the unlabeled samples are taken. Additional problems to which these methods are applicable include: estimation of proportions and adaptive classification (estimation of mean signatures and covariances). Author

N75-26741*# Houston Univ., Tex. Dept. of Mathematics.
A COUNTER EXAMPLE IN LINEAR FEATURE SELECTION THEORY
Dennison R. Brown and M. J. OMalley Mar. 1975 7 p refs
(Contract NAS9-12777)
(NASA-CR-141881; Rept-41) Avail: NTIS HC $3.25 CSCL 12A

The linear feature selection problem in multi-class pattern recognition is described as that of linearly transforming statistical information from n-dimensional (real Euclidean) space into k-dimensional space, while requiring that average interclass divergence in the transformed space decrease as little as possible. Divergence is the expected interclass divergence derived from Hajek two-class divergence; it is known that there always exists a k x n matrix B such that the transformation determined by B maximizes the divergence in k-dimensional space. It is known that, if Q is any k x k invertible matrix, and B is as defined above, then QB again maximizes the divergence in k-space. It is shown that the converse of this result is false: two matrices exist, B sub 1 and B sub 2, each of which maximizes transformed divergence, which are not related in the fashion B sub 2 = QB sub 1 for any k x k matrix Q. Author

N75-26742*# Houston Univ., Tex. Dept. of Mathematics.
HOUSEHOLDER TRANSFORMATIONS AND OPTIMAL LINEAR COMBINATIONS
Henry P. Decell, Jr. and William Smiley, III Jun. 1974 14 p refs
(Contract NAS9-12777)
(NASA-CR-141879; Rept-38) Avail: NTIS HC $3.25 CSCL 12A

Several theorems related to the Householder transformation and separability criteria are proven. Orthogonal transformations, topology, divergence, mathematical matrices, and group theory are discussed. M.J.S.

N75-26743*# Houston Univ., Tex. Dept. of Mathematics.
ON THE VARIATIONAL EQUATIONS FOR HOUSEHOLDER TRANSFORMATIONS IN FEATURE SELECTION
Henry P. DeCell, Jr. and Mike Mayekar Mar. 1975 8 p refs
(Contract NAS9-12777)
(NASA-CR-141880; Rept-39) Avail: NTIS HC $3.25 CSCL 12A

Results that suggest the possibility of using a sequential monotone process for solving the feature selection problem using Householder transformations are applied to the divergence separability criterion and an expression for the gradient of the divergence with respect to the generator of a single Householder transformation will be developed. This expression for the gradient is used in any number of differential correction schemes (iterators) that attempt to extremize the divergence. Data sets provided by the Earth Observations Division-JSC are used to demonstrate selecting the Householder transformations that generate the kxn matrix defining the best (in the sense of extremizing the divergence) k linear combinations of features. The tests allow initial comparisons to be made with results. In particular, this technique does not appear to require initial guesses for the iterator to be generated without replacement, exhaustive search, or other similar schemes. Author

N75-26744*# Kanner (Leo) Associates, Redwood City, Calif.
RIEMANN'S METHOD IN THE INVERSE PROBLEM OF SCATTERING THEORY, PART 2
H. I. Gugushvili and Yu. L. Mentkovskiy Washington NASA Jun. 1975 10 p refs Transl. into ENGLISH from Russian preprint Rept. ITF-70-76-p, 1970 10 p
(Contract NASw-2481)
(NASA-TT-F-16428-Pt-2; ITF-70-76-p) Avail: NTIS HC $3.25 CSCL 12A

A previously constructed procedure for reconstructing the nuclear potential on the basis of nuclear-Coulomb, s-scattering data is examined. The upper and lower bound estimates for Riemann's function and the kappa-function associated with the potential obtained earlier are improved, and the method used is generalized to the case of arbitrary angular momentum. Author

N75-26745# Michigan State Univ., East Lansing. Dept. of Mathematics.
ON RIVILIN'S CONJECTURE FOR UNISOLVENT FAMILIES Interim Report
Gh. Cimoca Cluj and G. D. Taylor 1974 10 p refs
(Grant AF-AFOSR-2271-72; AF Proj. 9749)
(AD-A004335; AFOSR-75-0015TR) Avail: NTIS CSCL 12/1

It is shown that Rivlin's conjecture is valid for the case of a pair ((phi sub m),(phi sub n)) of elements (phi sub i) a member of (F sub i), (F sub i) a nonlinear unisolvent family of degree i, i = m, n with m < n and (F sub m) contained in (F sub n). GRA

N75-26746# Wisconsin Univ., Madison. Mathematics Research Center.
A SMOOTH AND LOCAL INTERPOLANT WITH SMALL k-th DERIVATIVE Summary Report
Carl DeBoor Dec. 1974 41 p refs
(Contract DA-ARO(D)-31-124-74-462)
(AD-A003703; MRC-TSR-1466) Avail: NTIS CSCL 12/1

This report is a continuation of MRC TSR 1425, How small can one make the derivatives of an interpolating function., and is concerned with estimating the number (K sub 0) - inf C sub k with the infimum taken over all C sub k. Knowledge about (K sub 0)(k) makes it possible to estimate the derivatives (up to and including the k-th) of some smooth interpolant to give data directly from the divided differences of the data without actually constructing such an interpolant and its derivatives, thus facilitating the process of estimating the residual error of a finite difference approximation. GRA

N75-26747# Naval Postgraduate School, Monterey, Calif.
ON PREDICTION INTERVALS FROM NORMAL SAMPLES Technical Report, Jan. - Dec. 1974
Toke Jayachandran Dec. 1974 18 p refs
(AD-A003810; NPS-53JX74121) Avail: NTIS CSCL 12/1

It is shown that the prediction intervals derived by Hahn and Hickman for the mean, standard deviation as well as all the observations of a future random sample based on an earlier information random sample are valid even when the sample observations are correlated and have a specified correlation structure such as interclass correlation. GRA

N75-26748# California Univ., Berkeley. Operations Research Center.
MARKOV CHAIN MODELS; RARITY AND EXPONENTIALITY
Julian Keilson Oct. 1974 192 p refs
(Contract N00014-69-A-0200-1070; NR Proj. 042-238)
(AD-A003559; ORC-74-32) Avail: NTIS CSCL 12/2

This study has three goals. The first is the presentation of working tools needed to quantify the behavior of finite Markov chains in discrete and continuous time when the chain has many degrees of freedom. The second goal is the development in detail of topics, surrounding reversibility in time, a basic key to tractability. Finally emphasis is given to rarity and exponentiality, i.e., to the limit theorems concerning these, to measures of exponentiality and error bounds associated with such measures, and to the quantification of departures from exponentiality in

failure time distributions for systems modeled by finite chains. GRA

N75-26749# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
CONE BOUNDED NONLINEARITIES AND MEAN SQUARE BOUNDS, ESTIMATION LOWER BOUND Interim Report
Ian B. Rhodes and Alfred S. Gilman (Lincoln Lab., MIT, Lexington) 1974 36 p refs
(Contract F44620-69-C-0116; AF Proj. 9749)
(AD-A004170; AFOSR-75-0077TR) Avail: NTIS CSCL 12/1

This paper is the second in a series of three in which performance bounds are derived for causal state estimation and regulation problems employing mean square criteria. The systems considered are partially-observed finite dimensional continuous-time stochastic processes driven by additive white Gaussian noise. The particular systems to which the bounds apply are those which, when modeled by Ito differential equations, contain drift (dt) coefficients which are, to within a uniformly Lipschitz residual, jointly linear in the system state and externally applied control. GRA

N75-26750# Naval Postgraduate School, Monterey, Calif.
A O(H SUP 4) CUBIC SPLINE COLLOCATION METHOD FOR QUASILINEAR PARABOLIC EQUATIONS Technical Report, Sep. - Dec. 1974
D. A. Archer 11 Dec. 1974 35 p refs
(AD-A003865; NPS-53Ac74121) Avail: NTIS CSCL 12/1

A modified version of the usual cubic spline collocation method is proposed and analyzed for quasilinear parabolic problems. Continuous time estimates of order O(h sup 4) are obtained, via arguments based on certain discrete inner-products, for a uniform mesh and sufficiently smooth problems. Two types of collocation at the boundary are studied and shown to yield O(h sup 4) and O(h sup(7/2)) rates of convergence. GRA

N75-26751# Naval Postgraduate School, Monterey, Calif.
PROPERTIES OF THE BIVARIATE DELAYED POISSON PROCESS
A. J. Lawrence and P. A. W. Lewis Jul. 1974 20 p refs
(NR Proj. 042-284; RR0140501)
(AD-A003892; NPS-55Lw74071) Avail: NTIS CSCL 12/1

The bivariate Poisson point process introduced in Cox and Lewis (1972), and there called the bivariate delayed Poisson process, is studied further; the process arises from pairs of delays on the events of a Poisson process. In particular, results are obtained for the stationary initial conditions, the joint distribution of the number of operative delays at an arbitrary time, the asynchronous counting distribution, and two semi-synchronous interval distributions. The joint delay distribution employed allows for dependence and two-sided delays, but the model retains the independence between different pairs of delays. GRA

N75-26752# Naval Postgraduate School, Monterey, Calif.
SOME REMARKS ON THE FINITE-MEMORY K-HYPOTHESES PROBLEMS
Bruno O. Shubert Oct. 1974 28 p refs
(AD-A003893; NPS-55SY74101) Avail: NTIS CSCL 12/1

Finite-memory statistical problems typically deal with the situation where the class of statistics is restricted to those taking on a fixed finite number of values. Although a potentially infinite number of samples may be available the statistician is allowed to base his inference only on the current value of such a statistic - the current state of his finite memory. This is the case for instance when the inference is to be performed by a small size computer. During the past several years a number of results have been obtained concerning a two-hypotheses finite-memory problem. In this report the author considers some aspects of the case where the number of hypotheses is greater than two. GRA

N75-26753# Texas A&M Univ., College Station.
A LINEAR MODEL INVOLVING ORDER STATISTICS
W. J. Wilson Dec. 1974 17 p refs
(Contract N00014-68-A-0140; NR Proj. 047-700)
(AD-A003593; TR-47) Avail: NTIS CSCL 12/1

This report considers the large sample variance of the regression coefficients of a certain linear model involving order statistics arising in estimation of the global maximum of a distribution function with finite range. This variance is obtained using the delta method, also called the method of statistical differences. GRA

N75-26754# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
CONE-BOUNDED NONLINEARITIES AND MEAN-SQUARE BOUNDS: SMOOTHING AND PREDICTION BOUNDS Interim Report
Keh-Ping Dunn (MIT, Cambridge) and Ian B. Rhodes 1974 30 p refs
(Contract F44620-69-C-0116; Grant NSF GK-22905A; AF Proj. 9749)
(AD-A004171; SSM-7405; AFOSR-75-0078TR) Avail: NTIS CSCL 12/1

Mean-square performance bounds are derived for smoothing and prediction problems associated with a class of nonlinear dynamic systems. The systems considered are partially-observed finite dimensional continuous-time stochastic processes driven by additive white Gaussian noise. The particular systems to which the bounds apply are those which, when modeled by Ito differential equations, contain drift (.dt) coefficients which are, to within a uniformly Lipschitz residual, jointly linear in the system state and externally applied control. All the bounds are rigorously derived and independent of control or control law. GRA

N75-26755# Wisconsin Univ., Madison. Mathematics Research Center.
THE MINIMUM NUMBER OF EDGES AND VERTICES IN A GRAPH WITH EDGE CONNECTIVITY n AND m n-BONDS Summary Report
Robert E. Bixby Dec. 1974 68 p refs
(Contract DA-ARO(D)-31-124-74-462)
(AD-A003717; MRC-TSR-1493) Avail: NTIS CSCL 12/1

Essentially closed form expressions are obtained for the minimum number of edges and vertices in a graph with edge connectivity n and m n-bonds. GRA

N75-26756# Wisconsin Univ., Madison. Mathematics Research Center.
FIXED POINT PROPERTIES OF PRODUCT SPACES Summary Report
Albrecht Dold Dec. 1974 11 p refs
(Contract DA-ARO(D)-31-124-74-462)
(AD-A003716; MRC-TSR-1490) Avail: NTIS CSCL 12/1

A self-map (F:Y sub 1 X Y sub 2 approaches the limit of Y sub 1 X Y sub 2) of a product space induces self-maps (F sub 1:Y sub 1 approaches the limit of Y sub 1, F sub 2:Y sub 2 approaches the limit of Y sub 2)of the axes. If Y sub 2 is a projective space (or cohomologically similar), then the algebraic number of fixed points is shown to satisfy L(F) = L(F sub 1) times L(F(m))sub 2) for some m. The algebraic proof is presented. GRA

N75-26757# North Carolina Univ., Chapel Hill.
SIMULATION DATA ANALYSIS USING CONTINUOUS TIME MARKOV PROCESSES
George S. Fishman Nov. 1974 26 p refs
(Contract N00014-67-A-0321-0008; NR Proj. 047-139)
(AD-A003902; TR-74-1) Avail: NTIS CSCL 12/2

This paper illustrates the use of continuous time Markov processes as a basis for analyzing the results of discrete event digital simulations. In particular, the paper describes how judicious use of bit packing enables a user to write an otherwise lengthy state description in concise form for convenient use within an ongoing program. It also describes a procedure for selecting which among the many possible regeneration states allows a user to collect data most efficiently for analysis. GRA

N75-26758# Michigan Univ., Ann Arbor. Dept. of Mathematics.
GRAPH THEORY WITH APPLICATIONS TO AIR FORCE SYSTEMS Interim Report, 1 Apr. 1973 - 30 Mar. 1974
Frank Harary 30 Aug. 1974 7 p refs
(Grant AF-AFOSR-2502-73)
(AD-A003983; AFOSR-75-0040TR) Avail: NTIS CSCL 12/1

This report is a brief summary of research accomplishments

by the author and his associates during the period 1 April 1973 through 30 Mar 1974. The areas discussed include graphical enumeration, e.g., counting the number of spanning trees of a graph, graph topology, generalized Ramsey theory, integral characteristic polynomials of adjacency matrices, and communication problems. A list of publications which contain the detailed research findings is provided. GRA

N75-26759# North Carolina Univ., Chapel Hill. Dept. of Statistics.
STATISTICAL TESTS BASED ON THE LEVY AND PROHOROV METRICS Ph.D. Thesis
Charles H. Alexander Nov. 1974 121 p refs
(Grant AF-AFOSR-2386-72)
(AD-A003986; Mimeo-Ser-965) Avail: NTIS CSCL 12/1

The author develops non-parametric one-sample and two-sample goodness-of-fit tests using as test statistics the Levy and Prohorov distance between empirical distribution functions. Computational procedures are described for computing the test statistics. Recurrence equations are described for computing the distribution of the two-sample test statistics, using results about the maximal matchings in certain graphs. The asymptotic distribution of the one-sample test statistic is expressed in terms of the distribution of fluctuations in the sample path of the Brownian Bridge stochastic process. Tables of these distributions are given in the appendix. GRA

N75-26760# Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
SEQUENTIAL CONJUGATE GRADIENT RESTORATION ALGORITHM FOR OPTIMAL CONTROL PROBLEMS. PART 2: EXAMPLES
J. C. Heideman and A. V. Levy 1974 58 p refs
(Grant AF-AFOSR-2185-72)
(AD-A004089; AAR-117; AFOSR-75-0053TR) Avail: NTIS CSCL 12/1

In another paper Heideman and Levy developed the sequential conjugate gradient-restoration algorithm for minimizing a functional subject to differential constraints and terminal constraints. In this report, several numerical examples are presented, some pertaining to a quadratic functional subject to linear constraints and some pertaining to a nonquadratic functional subject to nonlinear constraints. These examples demonstrate the feasibility as well as the rapid convergence characteristic of the sequential conjugate gradient-restoration algorithm. GRA

N75-26761# Princeton Univ., N.J. Dept. of Electrical Engineering.
SOME RESULTS ON THE CHARACTERIZATION OF RANDOM SEQUENCES AND RELATED PULSE TRAINS
G. L. Wise and J. B. Thomas Oct. 1974 12 p refs Presented at 12th Ann. Allerton Conf. on Circuit and System Theory, 2-4 Oct. 1974
(Grant AF-AFOSR-2101-71; AF Proj. 9749)
(AD-A003733; AFOSR-74-1897TR) Avail: NTIS CSCL 12/1

A class of stationary Markov sequences is considered. The diagonal series expansion of the bivariate density corresponding to any two random variables in the Markov sequence is derived. Some properties of pulse trains are also considered, where the amplitudes of the pulses form a Markov sequence. GRA

N75-26762# California Univ., Santa Barbara. Dept. of Mathematics.
REARRANGEMENT AND EXTREMAL RESULTS FOR HERMITIAN MATRICES Interim Report
Marvin Marcus 1974 14 p refs
(Grant AF-AFOSR-2164-72; AF Proj. 9749)
(AD-A004443; AFOSR-74-1667TR) Avail: NTIS CSCL 12/1

This paper contains extreme value results for concave and convex geometric functions of the eigenvalues of B + P*AP as functions of the partial isometry P. The matrices A and B are hermitian. GRA

N75-26763# Naval Postgraduate School, Monterey, Calif.
ON THE DETERMINATION OF PLANAR GRAPHS M.S. Thesis
Chong-Hwa Kim Dec. 1974 79 p refs
(AD-A004244) Avail: NTIS CSCL 12/1

Various algorithms for testing the planarity of a graph are reviewed. The Phung-Chan algorithm is improved by modifying the method of application of the necessary and sufficient condition that a pseudo-Hamiltonian graph be planar and the method of determination of circuit C(k) with as many edges as possible, and from which the pseudo-Hamiltonian graph is defined. By application of the proposed algorithm it is proved that the algorithm can be applied to an arbitrary graph. Using this proposed algorithm, the rate of convergence of the algorithm is increased and the computer storage requirement is minimized. GRA

N75-26764# Wisconsin Univ., Madison. Mathematics Research Center.
MULTIVARIATE APPROXIMATION SCHEMES AND THE APPROXIMATION OF LINEAR FUNCTIONALS
G. H. Coman Dec. 1974 41 p refs
(Contract DA-ARO(D)-31-124-74-462)
(AD-A003695; MRC-TSR-1447) Avail: NTIS CSCL 12/1

The purpose of this report is to study some multivariate numerical approximation schemes derived from a blending-function approximation of a given function of several variables, in such a way that the approximation order of the original approximation is preserved. The approximation schemes so obtained are used for the approximation of linear functionals defined over a space of functions of several variables. Also, some illustrative examples are included. GRA

N75-26765# Wisconsin Univ., Madison. Mathematics Research Center.
A QUASI-PROJECTION APPROXIMATION METHOD APPLIED TO GALERKIN PROCEDURES FOR PARABOLIC AND HYPERBOLIC EQUATIONS
Jim Douglas, Jr., Todd Dupont, and Mary F. Wheeler Oct. 1974 48 p refs
(Contract DA-ARO(D)-31-124-74-462)
(AD-A003702; MRC-TSR-1465) Avail: NTIS CSCL 12/1

A technical method of approximating the Galerkin approximation to solutions of parabolic and hyperbolic equations can be based on a finite sequence of elliptic projections. The resulting function is called a quasi-projection, and it is used to study superconvergence phenomena associated with the Galerkin procedures. GRA

N75-26766# Wisconsin Univ., Madison. Mathematics Research Center.
EVOLUTION EQUATIONS IN INFINITE DIMENSIONS
Luc Tartar Dec. 1974 23 p refs
(Contract DA-ARO(D)-31-124-74-462)
(AD-A003707; MRC-TSR-1485) Avail: NTIS CSCL 12/1

This is a short survey of some existence theorems for evolution equations in infinite dimensions. In the first section the differences with the finite dimensional case are emphasized. In the second one existence theorems using approximation by finite dimensional problems (Galerkin's method) are given. In the third, some other existence theorems are obtained by application of various fixed point theorems. GRA

N75-26767# Army Mathematics Steering Committee.
PROCEEDING OF THE 11TH ARMY NUMERICAL ANALYSIS CONFERENCE
Dec. 1974 602 p refs Conf. held at Philadephia, 13-14 Feb. 1974
(AD-A003851; ARO-74-2) Avail: NTIS CSCL 12/1

This is a technical report resulting from the 1974 Army Numerical Analysis Conference. It contains papers on computer aided design and engineering, as well as papers on numerical analysis. GRA

N75-26768# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.
APPROXIMATION OF COMPLEX AEROSPACE SYSTEMS BY SIMPLER ONES
R. F. Drenick Jul. 1974 23 p refs
(Grant AF-AFOSR-2389-72; AF Proj. 9749)
(AD-A003754; AFOSR-75-0039TR) Avail: NTIS CSCL 12/1

This report is a summary of progress by the author and his associates in their research on the approximation of complex aerospace systems during the period 1 June 1973 through

31 May 1974. Prior research had led to the development of methods for approximating the model of such systems with simpler models which retained main characteristics yet omitted superfluous detail. The research during this period was concerned with the application of one of these methods to approximation of a vibration model of an aircraft wing and an electrical circuit model for a low pass filter, with primary emphasis on computational considerations. GRA

N75-26769# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
ON THE DISTRIBUTIONS OF THE RATIOS OF THE EXTREME ROOTS OF THE REAL AND COMPLEX MULTIVARIATE BETA MATRICES Interim Report, 1 Jun. 1973 - 1 Jun. 1974
P. R. Krishnaiah and F. J. Schuurmann Oct. 1974 93 p refs
(Contract F33615-71-C-1463; AF Proj. 7071)
(AD-A004774; ARL-74-0122) Avail: NTIS CSCL 12/1

In this report, the authors consider the evaluation of the probability integrals associated with the ratios of the extreme roots of the real and complex multivariate beta matrices. Tables for these distributions are also given. Finally, the authors discuss the evaluation of these distributions. GRA

N75-26770# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
ON THE EXACT DISTRIBUTIONS OF THE RATIOS OF THE EXTREME ROOTS OF THE REAL AND COMPLEX WISHART MATRICES
P. R. Krishnaiah and F. J. Schuurmann Oct. 1974 15 p refs
(Contract F33615-71-C-1463; AF Proj. 7071)
(AD-A004778; ARL-74-0118) Avail: NTIS CSCL 12/1

In this paper, the authors discuss the evaluation of the probability integrals associated with the distributions of the ratios of the extreme roots of the Wishart matrix in the real and complex cases. Some percentage points of these distributions are also given. GRA

N75-26771# Technology, Inc., Dayton, Ohio.
PROCEDURES USING ORTHOGONAL TRANSFORMATIONS FOR LINEAR LEAST SQUARES PROBLEMS Technical Interim Report, 21 Aug. 1973 - 20 Aug. 1974
Nai-kuan Tsao and Paul J. Nikolai Oct. 1974 40 p refs
(Contract F33615-73-C-4155; AF Proj. 7071)
(AD-A004417; ARL-74-0124) Avail: NTIS CSCL 12/1

Given a real matrix A not necessarily square and a vector b of compatible length, the linear least squares problem seeks the minimum euclidean distance between b and the range of A. Two newly devised algorithms for the numerical solution of the linear least squares problem are described which feature modified Householder transformations. Some numerical experiments are also described. GRA

N75-26772# Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
A HYBRID APPROACH TO OPTIMAL CONTROL PROBLEMS WITH BOUNDED STATE. PART 2: EXAMPLES
A. Miele, J. L. Tietze, and J. R. Cloutier 1974 60 p refs
(Grant AF-AFOSR-2185-72; AF Proj. 9749)
(AD-A004808; AAR-115; AFOSR-75-0144TR) Avail: NTIS CSCL 12/1

In another paper, Miele, Tietze, and Cloutier developed a modification of the sequential gradient-restoration algorithm for minimizing a functional subject to different constraints. In this report, five numerical examples are presented, some pertaining to the fixed-final-time case and some pertaining to the free-final-time case. The numerical results show the rapid convergence characteristics of the modification of the sequential gradient-restoration algorithm. GRA

N75-26773# Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
NEW TRANSFORMATION TECHNIQUE FOR OPTIMAL CONTROL PROBLEMS WITH BOUNDED STATE. PART 1: THEORY
A. Miele and J. R. Cloutier 1974 56 p refs
(Grant AF-AFOSR-2185-72; AF Proj. 9749)
(AD-A004333; AAR-122-Pt-1; AFOSR-75-0142TR-Pt-1) Avail: NTIS CSCL 12/1

The numerical solution of optimal control problem involving a state inequality constraint of the form L(x,theta) greater than or equal to 0 is considered. The approach employed is of the hybrid type, in an attempt to combine some of the best features of the indirect approach and the direct approach. While a predetermined number and sequence of subarcs are assumed (a feature of direct methods), enforcement of the state inequality constraint was obtained through a Valentine-type representation (a feature of indirect methods). A new transformation technique was developed by applying the Valentine-type representation to the k-th derivative of the function L(x,theta), assumed to have a constant sign in each of the subarcs composing the extremal arc. The algorithm developed belongs to the class of sequential gradient-restoration algorithms. The principal property of the algorithm is that it produces a sequence of feasible suboptimal solution: the functions x(t), u(t), pi obtained at the end of each cycle satisfy the constraints to a predetermined accuracy. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-26774# George Washington Univ., Washington, D.C.
SOME NEW RESULTS IN THE STATISTICAL ANALYSIS OF STOCHASTIC PROCESSES OF THE RELIABILITY AND QUEUEING TYPE Ph.D. Thesis
T. R. Thiagarajan 8 Oct. 1974 111 p refs
(Contract N00014-67-A-0214; NR Proj. 347-020)
(AD-A003928; T-308) Avail: NTIS CSCL 12/1

Gnedenko's F test for exponentiality is discussed with a stress on its application to the Weibull distribution. When the true values of the parameters of the Weibull distribution are not known, a few specific estimators are used for them and the critical values for Gnedenko's test statistic are derived and tabulated in each case. The power of this test is calculated for the Erlang and log-normal alternatives and compared to that of Kolmogorov-Smirnov, Anderson-Darling and other distance statistics. A second application is made in the field of queueing theory. If a queue exists and one is able to observe the line or system waits of successive customers and to know that the interarrival times are independent identically distributed exponentials with the same parameter lambda, then the hypothesis that the service distribution is exponential with parameter mu is tested. Both these problems are addressed and solved. Computer programs in FORTRAN, which are necessary to obtain various results, are listed. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-26775 Wisconsin Univ., Madison.
THE MONTE CARLO SOLUTION OF LARGE LINEAR SYSTEMS Ph.D. Thesis
Peter Brian Wilson 1974 123 p
Avail: Univ. Microfilms Order No. 75-8649

Various Monte Carlo algorithms for the solution of large linear systems of equations are analyzed. Computational results are presented, and the types of problems best suited to Monte Carlo solution are discussed. Previous results concerning the variance of the standard methods are extended and the conditions necessary for a finite variance are delineated. A new generalized method is introduced for which, it is always possible to ensure a finite variance. Supporting theory is developed for estimating the norm of powers of normal matrices. This theory is used to derive explicit criteria which guarantees a finite variance when the matrix is normal. New applications of the Monte Carlo method to certain initial value problems are presented, and the variance of each method is analyzed. For linear problems with constant coefficients, it is shown that the variance will always be finite.

Conditions yielding a small variance are discussed.
Dissert. Abstr.

N75-26776# Naval Ship Engineering Center, Philadelphia, Pa.
A METHOD FOR THE IDENTIFICATION OF DYNAMIC SYSTEMS Interim Report
J. R. Garnett 11 Dec. 1974 26 p refs
(AD-A004165; IR-1) Avail: NTIS CSCL 12/1

This interim report introduces the mathematical development of a new method for identifying system transfer functions from input-output data. Discussion contained herein covers: The mathematical basis for the method; An analytical example to illustrate the application of the method; and, A computer example which provides the groundwork for the practical application of the method. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-26777# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany).
SUBGROUPS OF SPECIALLY PRESENTED GROUPS [UNTERGRUPPEN SPEZIELL PRAESENTIERTER GRUPPEN]
Juergen Ackva 1974 88 p refs In GERMAN Sponsored in part by Bundesmin. fuer Forsch. u. Technol. and Landesamt fuer Forsch. des Landes Nordrhein-Westfalen
(BMFT-GMD-93) Avail: NTIS HC $4.75

A generalization of the freedom principle is given, based on the significance of the principle for groups with a defining relator. The properties of groups with several defining relators are described. ESRO

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-26778# Advisory Group for Aerospace Research and Development, Paris (France).
ELECTRO-OPTICAL SYSTEMS
May 1975 142 p refs
(AGARD-LS-76) Avail: NTIS HC $5.75

Military applications of optic-electronics are reported. The design and application of display devices including helmet mounted devices are discussed. The design and limitations of cockpit and display devices are described for human factors engineering. For individual titles, see N75-26779 through N75-26787.

N75-26779 Hughes Aircraft Co., Culver City, Calif.
LASER AND LOW LIGHT LEVEL TELEVISION SYSTEMS c36
Richard D. Hudson, Jr. and Jacqueline W. Hudson (Arjay Associates, Encino, Calif.) *In* AGARD Electro-Opt. Systems May 1975 14 p refs (For availability see N75-26778 17-70)

A system-oriented discussion is presented of the design of typical electro-optical systems. Laser rangefinders, laser target designators, and low light level television systems are described as examples of active and semiactive systems. Design equations are developed from first principles but in a way that emphasizes the physical nature of the quantities involved. Several examples of designs are carried out in detail so as to illustrate the manner in which a typical system design proceeds. Author

N75-26780 Marconi-Elliott Avionic Systems Ltd., Rochester (England).
THE APPLICATION OF DISPLAYS IN NAVIGATION/ATTACK SYSTEMS c04
J. T. Shepherd *In* AGARD Electro-Opt. Systems May 1975 19 p (For availability see N75-26778 17-70)

The use of display systems during the navigation/attack phase of an aircraft mission is outlined. The types of display used and their advantages and limitations are discussed. Author

N75-26781 Hughes Aircraft Co., Culver City, Calif.
FORWARD LOOKING INFRARED SYSTEMS c74
Richard D. Hudson, Jr. and Jacqueline W. Hudson (Arjay Associates, Encino, Calif.) *In* AGARD Electro-Opt. Systems May 1975 12 p refs (For availability see N75-26778 17-70)

A system-oriented discussion is provided of the design of typical electro-optical systems. Forward looking infrared systems, unlike those described earlier, are an example of a passive sensor system. Design equations are developed from first principles but in a way that emphasizes the physical nature of the quantities involved. The system design process is described and analyzed with emphasis on the tradeoffs that can be made during a design. The advantages of designing with background-limited (Blip) detectors are described. A sample design is provided so as to illustrate the manner in which a typical system design proceeds. Author

N75-26782 Marconi-Elliott Avionic Systems Ltd., Rochester (England).
HELMET MOUNTED SIGHTS AND DISPLAY SYSTEMS c74
J. T. Shepherd *In* AGARD Electro-Opt. Systems May 1975 13 p (For availability see N75-26778 17-70)

The design and capabilities are reviewed of helmet mounted sights and display systems in the context of a modern navigation/attack. Author

N75-26783 EMI Electronics Ltd., Feltham (England). Ergonomics Lab.
OPTO-ELECTRONIC SYSTEMS: PERCEPTUAL LIMITATIONS AND DISPLAY ENHANCEMENT c74
A. A. Clarke *In* AGARD Electro-Opt. Systems May 1975 12 p refs (For availability see N75-26778 17-70)

Sensor-display combinations are described which show how they may be designed to extend the limits imposed by the operators perceptual capabilities and environment. It is shown that CRT displays are the most appropriate and a discussion of the various display enhancement techniques are included. Author

N75-26784 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
TOTAL COCKPIT IMPLICATIONS OF ELECTRO-OPTICAL DISPLAYS c74
John M. Reising *In* AGARD Electro-Opt. Systems May 1975 16 p refs (For availability see N75-26778 17-70)

The implications for using electro-optical displays to replace many of the electro-mechanical instruments are discussed. A short history of cockpit development is given to show the growth of cockpit instrumentation. After discussing the F-111 as an example of a modern electro-mechanical cockpit, the question is asked, 'Where do we go from here?' Early developments in electro-optical cockpits are reviewed and current research programs are discussed. The unique impacts of electro-optical displays in the design of both close air support and air superiority aircraft are examined in detail. Finally, the future of the electro-optical cockpit is discussed and conclusions reached as to its viability. Author

N75-26785 EMI Electronics Ltd., Feltham (England). Ergonomics Lab.
TWO WORLD DISPLAYS: HUMAN ENGINEERING ASPECTS c06
A. A. Clarke *In* AGARD Electro-Opt. Systems May 1975 8 p refs (For availability see N75-26778 17-70)

The known information requirements are described for aircrew under three particular mission constraints and shows possible display formats and illustrates applications. Author

N75-26786 Naval Research Lab., Washington, D.C.
OPTICAL FIBER APPLICATIONS c74
A. Fenner Milton *In* AGARD Electro-Opt. Systems May 1975 21 p (For availability see N75-26778 17-70)

Optical fibers for communication and data transmission are reported. Military applications of the fiber optic links are shown.

The principal methods of making optical fibers with a lower index cladding are included. M.C.F.

N75-26787 British Aircraft Corp., Warton (England). Military Aircraft Div.
AIRCRAFT DESIGN IMPLICATIONS OF OPTO-ELECTRONIC SYSTEMS **c74**
W. I. McFarlane *In* AGARD Electro-Opt. Systems May 1975 22 p (For availability see N75-26778 17-70)

The application of electro-optical systems to low level aircraft and helicopters is discussed with particular emphasis on the installational problems of weight, drag, the need for transparencies, and power and cooling requirements. In addition the need for integration and matching of these systems with other equipments, weapons and each other is illustrated from the point of view of optimizing the overall weapon system. Finally an objective is stated whereby these new developments can be integrated to maximize the usefulness of the crew by providing them with the right information from the right sensor on the right display at the right time for them to take executive action. Author

N75-26788 Polish Academy of Sciences, Warsaw.
THREE DIMENSIONAL PROBLEMS OF WAVE PROPAGATION IN ELASTIC VISCO-PLASTIC MEDIA [TROJWYMIAROWE ZAGADNIENIA ROZPRZESTRZENIANIA SIE FAL W OSRODKACH SPREZYSTO-LEPKOPLASTYCZNYCH]
WojciechKrzysztof Nowacki 6 Dec. 1974 120 p refs In POLISH
Avail: Issuing Activity

Wave propagation problems in the theory of viscoplasticity are discussed; these are connected with intensive dynamic loads on construction elements, during which the stress intensity causes plastic deformation of these elements. Properties of dynamic metals are described, and constitutive equations are given for plastic media sensitive to the speed of deformation. These equations are formulated into a system of curvilinear coordinates. Equations of motion are derived for the media along with continuity equations and conditions of dynamic and kinematic continuity. A solution is derived for the problem of dynamic cylindrical void found in elasto-viscoplastic media, and the results are given in a system of curvilinear orthogonal coordinates (bipolar coordinates). Transl. by M.J.S.

N75-26789*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANTI-GRAVITY DEVICE Patent Application
Sudarshan Palsingh, inventor (to NASA) (NAS-NRC) Filed 28 May 1975 14 p Sponsored by NASA
(NASA-Case-MFS-22758-1; US-Patent-Appl-SN-581514) Avail: NTIS HC $3.25 CSCL 20K

An educational toy useful in demonstrating fundamental concepts regarding the laws of gravity is described. The device comprises a sphere 10 of radius r resting on top of sphere 12 of radius R. The center of gravity of sphere 10 is displaced from its geometrical center by distance D. The dimensions are so related that $D((R+r)/r)$ is greater than r. With the center of gravity of sphere 10 lying on a vertical line, the device is in equilibrium. When sphere 10 is rolled on the surface of sphere 12 it will return to its equilibrium position upon release. This creates an illusion that sphere 10 is defying the laws of gravity. In reality, due to the above noted relationship of D, R, and r, the center of gravity of sphere 10 rises from its equilibrium position as it rolls a short distance up or down the surface of sphere 12. Author

N75-26790# Oxford Univ. (England). Cryogenics Lab.
A MODIFICATION TO THE HSU MODEL FOR FINDING THE SIZE RANGE OF NUCLEATION SITES ON A HEATED SURFACE
W. B. Bald Sep. 1973 16 p refs
(OUEL-1112/74) Avail: NTIS HC $3.25

An analysis of the heat balance across the liquid-vapor interface of a growing bubble was made for cryogenic fluids of approximately zero contact angle. The analysis compares favorably with the model proposed by Hsu, although the more exact approach indicates higher heat fluxes to activate a given cavity size. The method discussed also suggests the existence of stationary bubbles which begin to grow and then remain stationary within the superheated layer; this is particularly evident when the bulk liquid is subcooled. ESRO

N75-26791# Denver Research Inst., Colo. Div. of Mathematical Sciences.
RECENTLY DEVELOPED FORMULATIONS OF THE INVERSE PROBLEM IN ACOUSTICS AND ELECTROMAGNETICS Final Report
Norman Bleistein and Norbert N. Bojarski Dec. 1974 37 p refs
(Contract N00014-67-A-0391-0005)
(AD-A003588; MS-R-7501) Avail: NTIS CSCL 20/14

Recently developed formulations of the inverse problems in acoustics and electromagnetics are described. There are two types of formulations, one in the geometrical optics limit and the other, an exact formulation for the inverse source problem. Both basic formulations are extended to include the realistic problem of a limited aperture of observations. It is also shown that the inverse source formulation can be applied to the problem of reconstruction of media inhomogeneities from remotely sensed field data. The basic physical optics result is that the characteristic function of the scattering obstacle and the phase and range normalized scattering amplitude are a Fourier transform pair. All other formulations lead to Fredholm integral equations of the first kind. GRA

N75-26792# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADIO FREQUENCY INTERFERENCE FROM LINEAR-FM PULSES Interim Technical Report
J. J. G. McCue 16 Jul. 1974 120 p refs
(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-215)
(AD-A003677; TR-512; ESD-TR-74-231) Avail: NTIS CSCL 20/14

Approximate expressions are obtained for the power spectrum and the phase spectrum of a rectangular pulse with linear FM. It is shown that the phase spectrum outside the nominal frequency band of the pulse is very different from the in-band spectrum, and that consequently interference picked up from the skirt of the spectrum will not undergo pulse compression. If a chirp receiver and a chirp pulse have center frequencies differing by at least the larger of the two bandwidths, calculations of radio-frequency interference can be made with good accuracy by ignoring the FM. The response of a chirp receiver to a nonmatching linear-FM or constant-frequency pulse can readily be calculated, even when the difference of the center frequencies is small. The calculation is discussed, first for rectangular pulses in receivers matched to rectangular pulses, and then for rectangular pulses in receivers with Hamming or similar weighting. GRA

N75-26793# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MEASUREMENT OF BALLISTIC IMPACT FLASH M.S. Thesis
John W. Mansur Oct. 1974 60 p refs
(AD-A004320; GAW/MC/74-29) Avail: NTIS CSCL 19/4

The downrange flash resulting from the perforation of thin aluminum plates by high velocity steel spheres was investigated to determine how the flash scales with changes in projectile velocity. It was found that two distinct flash intensity maximums occur; one approximately 10 microseconds after penetration, the second some 30 to 80 microseconds later. For a given size sphere, both the spectral irradiance of these two flashes and the energy of the flash scale as approximately the fourth power of the velocity. Coating the impact side of the target with epoxy based aircraft paint or a 0.002 inch layer of aircraft fuel cell sealant reduced the flash by factors or 5 to 300, depending on the wavelength examined. GRA

N75-26794# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE RELATIONSHIP OF PROJECTILE PROPERTIES AND DOWNRANGE BALLISTIC FLASH M.S. Thesis
John R. Wingfield Dec. 1974 48 p refs
(AD-A004321; GAE/MC/74-12) Avail: NTIS CSCL 19/4

The downrange ballistic flash resulting from the perforation of aluminum plates by steel spheres and disks and by aluminum spheres and disks was investigated to determine how the flash

relates to projectile composition and shape. The study focused on determining which projectile characteristics maximize the flash and its kill potential for detonating explosions and causing fires. GRA

N75-26795# Air Force Weapons Lab., Kirtland AFB, N.Mex.
ANALYSIS OF THE MUTUAL INDUCTANCE PARTICLE VELOCIMETER (MIPV) Final Report, Jun. 1973 - Jun. 1974
Joseph D. Renick Nov. 1974 134 p refs
(DNA Proj. NWET-J11AASX)
(AD-A004219; AFWL-TR-74-205) Avail: NTIS CSCL 18/3

Three analytical areas supporting development of the mutual inductance particle velocimeter (MIPV) are investigated. First, the basic theory is extended to permit calculation of gage factors and determination of design criteria for complex geometry gages. A finite element model is developed to investigate the effects of divergent/off-axis flow upon the gage response. Finally, an electromechanical mathematical model of the gage is developed to investigate the effects of shock-induced self-inductance and resistance charges upon gage response. GRA

N75-26796# Mission Research Corp., Santa Barbara, Calif.
THE EFFECT OF GROUND REFLECTION ON OBSERVED EMP WAVEFORMS
Michael A. Messier 11 Sep. 1974 99 p refs
(Contract DNA001-73-C-0118; DNA Proj. NWED-R99QAXE)
(AD-A004677; MRC-R-78; DNA-3370T) Avail: NTIS CSCL 18/3

Techniques and results are given for predicting EMP ground reflections from high altitude nuclear bursts including pulse penetration into the ground and signal polarizations. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N75-26797 British Library Lending Div., Boston Spa (England).
SOUND RADIATION VIA THE CHIMNEY
H. C. Herbst 9 Dec. 1974 13 p Transl. into ENGLISH from proceedings of VGB Conf. on Power Stations and the Environment (Essen), session C, paper 8, 27-28 Feb. 1973
(BLL-CE-Trans-6515-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Noise generated in the area of the Kiel district power station is discussed along with its identification and causes. Noise abatement measures are analyzed, and noise-reducing equipment is described. M.J.S.

N75-26798 Ohio State Univ., Columbus.
NOISE INVESTIGATION OF SMALL ENGINES Ph.D. Thesis
Mostafa Khosropour 1974 258 p
Avail: Univ. Microfilms Order No. 75-11375

The noise of small one-cylinder gasoline engines was investigated. A small dynamometer was built from an aircraft generator, and the gas forces inside the cylinder and the vibrational characteristics of the engine structure were studied. The effects of shaking forces and mechanical components (valves, camshaft, flywheel, etc.) on the noise of these engines were determined. The effects of parameters like speed, size, load, etc., were studied. An analytical model was developed to predict noise radiation due to mechanical excitation from inertia forces. Satisfactory correlation was achieved between the experimental data and the analytical predictions. Relationships for predicting the noise of these engines were developed and several recommendations for noise reduction are given. Dissert. Abstr.

N75-26799 Polish Academy of Sciences, Warsaw.
NONCONTACT METHOD OF MEASURING STRENGTH IN ULTRASONIC WAVEGUIDES IN REAL TIME [BEZKONTAKTOWA METODA POMIARU MOCY W FALOWODZIE ULTRADZWIEKOWYM W CZASIE RZECZYWISTYM]
Leszek Filipczynski and Zygmunt Toczyski 29 Nov. 1974 30 p refs In POLISH
Avail: Issuing Activity

A noncontact method is proposed for measuring acoustic power in a metal waveguide whose mean is considerably less than the wavelength. The method depends on the determination of the mean time product of instantaneous stress value and the velocity of acoustic waves. The surrounding waveguide is a concentric electrode, polarized with the aid of constant voltage. During wave propagation, periodic changes in the waveguide diameter follow, which cause changes in the electrode's capacitance. As a result of this, an electrical voltage change emerges in the electrode, which is proportional to the tension of the running wave. The theoretical bases of the method are presented, and additional investigations were conducted to compare the results using this method with the results obtained by using standing wave and dummy load methods.
Transl. by M.J.S.

N75-26800*# Kanner (Leo) Associates, Redwood City, Calif.
SOUND MEASUREMENT DURING COMPLEX NOISES, PART 1
Herbert Niese Washington NASA Jun. 1975 14 p refs Transl. into ENGLISH from Arch. Tech. Messen (West Germany), v. 55-58, no. 330, Jul. 1963 p 157-160
(Contract NASw-2481)
(NASA-TT-F-16429) Avail: NTIS HC $3.25 CSCL 20A

Difficulties in measuring sound during complex noises are discussed. Various instruments and methods of measurement are described, along with their rationale, results obtained and associated disadvantages. Suggestions are also made for measurement devices not yet in existence. Author

N75-26801*# Kanner (Leo) Associates, Redwood City, Calif.
VOLUME PRODUCTION IN BINAURAL HEARING OF COMPLEX NOISES
H. Niese Washington NASA Jun. 1975 34 p refs Transl. into ENGLISH from Hochfrequenztech. Elektroakust. (East Germany), v. 70, no. 4, Aug. 1961 p 132-141
(Contract NASw-2481)
(NASA-TT-F-16430) Avail: NTIS HC $3.75 CSCL 20A

Research and observations on the mechanical reproduction of human hearing are described along with the problem of duplicating binaural hearing with an apparatus. The use of a single receiving microphone is contrasted with the use of a stereophonic arrangement, and associated advantages of each are discussed. Author

N75-26802# Joint Publications Research Service, Arlington, Va.
NEW MEASUREMENT METHODS IN UNDERWATER ACOUSTICS AND RADIO ENGINEERING
L. L. Myasnikov et al 18 Jun. 1975 125 p refs Transl. into ENGLISH from the book "Novyye Metody Izmereniy v Podvodnoy Akustike i Radiotekhnike" Leningrad, Izd. Sudostroyeniye, 1974
(JPRS-65026) Avail: NTIS HC $5.25

A description and evaluation of new trends and methods in acoustic and electronic measurements performed under laboratory and sea conditions are reported. The report also contains an analysis of modern problems of acoustic and radio engineering measurements of underwater radiation and of propagation of both sound and electromagnetic oscillations at sea. Author

N75-26803# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.
THE CHANGE OF MICROPHONE SENSITIVITY UNDER MEAN FLOW CONDITIONS
Wolfgang Neise 31 Jan. 1975 24 p refs Sponsored by Deut. Forschungsgemeinschaft
(DLR-FB-75-23) Avail: NTIS HC $3.25; DFVLR, Porz, West Ger. 11 DM

Measurements were made to determine the effect of air flow on the sensitivity of microphone probes. Standard condenser microphones fitted with either a standard nose cone or a slit tube were investigated. A slit tube is a special device to suppress the turbulent noise signal when sound measurements are to be made within a flow. The experiments show that there is a loss of the acoustic sensitivity due to the air flow. However, the

mean sensitivity loss is less than 0.5 db up to 40 m/s and within a frequency range from 40 Hz to 1250 Hz. Therefore the loss in sensitivity may be neglected for most practical measurements. Author (ESRO)

N75-26804# Naval Underwater Systems Center, New London, Conn.
APPLICATION OF RAY THEORY TO LOW FREQUENCY PROPAGATION
Henry Weinberg 18 Dec. 1974 34 p refs
(NUSC Proj. A-654-3; ZR000010123)
(AD-A003473; NUSU-TR-4867) Avail: NTIS CSCL 20/1

The development of ray tracing techniques is reviewed, and the effects of various sound-speed representations on the computed value of propagation loss are discussed. Since modified ray theories designed to treat caustics lose their effectiveness at the lower acoustic frequencies, an alternative approach for the horizontally stratified case is proposed. For oceans that are nearly horizontally stratified, the method of horizontal rays is applicable. Computed predictions are compared with measured data. GRA

N75-26805# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
A METHOD FOR LOCATING SOURCES USING RANGE ONLY
Lawrence Cahoon and Melvin J. Hinich Dec. 1974 32 p refs
(Contract N00014-67-A-0314-0023; NR Proj. 042-315)
(AD-A003608; TR-89) Avail: NTIS CSCL 17/1

The distances to p + 1 targets are discussed with the p and 1'st targets being reference beacons, obtained from a moving platform. It is shown that the errors have a normal distribution with zero mean and are serially uncorrelated and spatially incoherent. The error structure, the position of two reference beacons, and the set of observations are described to accurately determine the positions of the remaining targets. M.C.F.

N75-26806# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
BEARING ESTIMATION USING A LARGE TOWED ARRAY
Melvin J. Hinch and William Rule Nov. 1974 25 p refs
(Contract N00014-67-A-0314-0023; NR Proj. 042-315)
(AD-A003607; TR-87) Avail: NTIS CSCL 17/1

When a towed array of hydrophones is significantly nonlinear due to bending, ordinary linear array beamforming gives a biased estimate of the true source bearing. By processing the array as a sequence of smaller aperture subarrays and then computing the median of the subarray bearings, the variation due to bending is reduced and a reasonably precise estimate is obtained if the average bending angle with respect to the nominal axis is zero. The median and mean subarray bearing is analyzed for a theoretical statistical model and is tested using artificial data for a sinusoidal and random bending model. GRA

N75-26807# Naval Ship Research and Development Center, Bethesda, Md.
MEASUREMENT OF THE ACOUSTIC PROPERTIES OF SOLID POLYMERS
William S. Cramer Dec. 1974 66 p refs
(ZF61412001)
(AD-A003469; NSRDC-4356) Avail: NTIS CSCL 20/1

The speed and attenuation of an acoustic wave in a homogeneous polymer can be measured directly in the laboratory at frequencies greater than 100 kilohertz. At lower frequencies, however, it is usually necessary to calculate the propagation properties from measurements of the dynamic elastic moduli and the density. Data on two of the three standard moduli (bulk, Young, and shear) are theoretically sufficient to describe any type of acoustic propagation in a homogeneous material. Each modulus consists of a storage modulus, indicating the in-phase component of stress and strain, and a loss modulus, indicating the out-of-phase component. A wide variety of measurements techniques has been employed, depending on the type of modulus to be studied and on the frequency range of interest. A survey is presented of the commonly used techniques, and their relative advantages and limitations are discussed. GRA

N75-26808# Naval Undersea Center, San Diego, Calif.
PROCEEDINGS OF THE WORKSHOP ON LOW-FREQUENCY SOUND SOURCES, VOLUME 1
Sep. 1974 283 p refs Workshop held at San Diego, 5-7 Nov. 1973
(AD-A003895; NUC-TP-404-Vol-1) Avail: NTIS CSCL 20/1

The report presents the papers contributed to the Workshop on Low-frequency Sound Sources held at the Naval Undersea Center, San Diego, California in November 1973. Speakers represented Department of Navy organizations and private companies. Topics covered fell into three general categories: naval needs for low-frequency sources; review and background; specific approaches and devices. A summary of the concluding panel discussion is also included. GRA

N75-26809# Naval Postgraduate School, Monterey, Calif.
SOUND SPEED DISPERSION, ATTENUATION AND INFERRED MICROBUBBLES IN THE UPPER OCEAN M.S. Thesis
Thomas Bartlett Huffman and Dennis Leeth Zveare Dec. 1974 119 p refs
(AD-A003783) Avail: NTIS CSCL 20/1

A portable underwater source-receiver system, supporting equipment, and digital computer software were developed to determine near-surface sound speed and attenuation at harmonic frequencies from 5 to 95 KHz simultaneously, and in-situ from a ship. These data have yielded values of bubble densities as a function of bubble radius from 40 to 1000 microns, depth to 15.2 meters, time of day, varying oceanographic conditions, and environmental parameters for two days in November in Monterey Bay. GRA

N75-26810# Naval Postgraduate School, Monterey, Calif.
A PRELIMINARY STUDY OF A SURFACE WAVE-ACOUSTICAL NORMAL MODE RESONANSE IN A FLUID-FILLED RECTANGULAR WAVEGUIDE WITH PRESSURE-RELEASE BOUNDARIES M.S. Thesis
Norman Ewing Davis and Morton William Kenyon Dec. 1974 69 p refs
(AD-A004255) Avail: NTIS CSCL 20/1

Studies of the effects of sinusoidal surface waves on the propagation of sound in a waveguide reveal a significant resonance effect under certain matching conditions of the wavelength of the surface wave and the wavelength of the acoustical sound field. An acoustic waveguide with constant cross-section and pressure release boundaries was designed with a termination to minimize reflection of both surface and acoustic waves so that traveling surface waves and traveling acoustic waves could be generated simultaneously. With acoustic and surface waves present, the existence of predicted resonances was verified and a strong resonance was examined for comparison with theory. The predicted effects have been qualitatively and quantitatively supported. GRA

N75-26811# Texas Univ., Austin. Applied Research Labs.
PROPAGATION OF PLANE WAVES OF FINITE AMPLITUDE IN INHOMOGENEOUS MEDIA WITH APPLICATIONS TO VERTICAL PROPAGATION IN THE OCEAN
Thomas W. Carlton and David T. Blackstock 22 Aug. 1974 47 p refs
(Contracts N00024-72-C-1380; N00014-70-A-0166; NR Proj. 384-317)
(AD-A004648; ARL-TR-74-31) Avail: NTIS CSCL 20/1

In the report the authors developed an approximate theory of propagation of plane progressive waves of finite amplitude in a medium with density, sound speed, and parameter of nonlinearity (B/A) varying along the path of propagation. It was found that this variation has two effects upon the wave. The first is a change in amplitude due to the variation in the impedance of the medium. The second is a change in the distance scale over which nonlinear effects develop. Once these two effects are accounted for, then this theory reduces in form to the theory of propagation in a homogeneous fluid, which theory is well developed. GRA

N75-26812# Catholic Univ. of America, Washington, D.C. Dept. of Electrical Engineering.
CAPABILITIES OF MULTIPLICATIVE ARRAY PROCESSORS

AS SIGNAL DETECTOR AND MULTIPLICATIVE ARRAY PROCESSORS AS SIGNAL DETECTOR AND BEARING ESTIMATOR Final Report, 1 May 1973 - 31 Dec. 1974
Leonard E. Miller and Jhong S. Lee 31 Dec. 1974 199 p refs
(Contract N00014-67-A-0377-0021; NR Proj. 042-312)
(AD-A004587) Avail: NTIS CSCL 20/1

Investigation is made of a multiplicative receiver array to determine its capability as signal detector and bearing estimator. The same analyses are made of the conventional square-law array for comparison purposes. The probability density functions for the filter outputs of array models are obtained for these arrays for the input signals consisting of monochromatic signals and narrowband additive Gaussian noise. The number of sensor elements, SNR, source bearing, and interelement noise correlation, are treated as parameters of the distribution, and their influences are displayed graphically. Based on these probability density functions for the square-law and multiplicative array processors, the authors then examine their performances as signal detectors and bearing estimators. GRA

N75-26813# Naval Postgraduate School, Monterey, Calif.
AMPLITUDE MODULATION OF ACOUSTIC SIGNALS BY OCEAN WAVES AND THE EFFECT ON SIGNAL DETECTION M.S. Thesis
James Blenn Perkins, III Dec. 1974 114 p refs
(AD-A004591) Avail: NTIS CSCL 20/1

A study was conducted of the amplitude modulation of an acoustic signal forward scattered from a wind-generated, model ocean surface. The demodulated spectrum of the surface scattered sound was compared with the model ocean spectrum while varying the acoustic frequency and angle of incidence. Several methods of enhancing signal detection through a knowledge of the ocean spectrum were studied. The most promising of these shows potential gains of the order of three decibels when the received signal is weak and fluctuating greatly, as at a Lloyd Mirror minimum. GRA

N75-26814# Naval Postgraduate School, Monterey, Calif.
ACOUSTIC FLUCTUATIONS DUE TO SHALLOW WATER THERMAL MICROSTRUCTURE M.S. Thesis
James Burgess Hagen Sep. 1974 153 p refs
(NR Proj. 083-275)
(AD-A004226) Avail: NTIS CSCL 20/1

Simultaneous measurements of waves, orthogonal water particle velocities, temperature, conductivity and acoustic phase and amplitude measurements at 20 and 40 kHz over horizontal and vertical, 2m paths were made at the Navel Underwater Center oceanographic tower, San Diego in April 1974. Four stochastic models for acoustic propagation including geometric, Born, Rytov and Debye approximation models were tested. Taylor thermal microscales from spatial correlation analyses determined vertically across the thermocline varied from 6.8 to 178 cm. Temporal stochastic analyses showed horizontal acoustic path losses were ten times vertical losses because of diffraction effects. GRA

N75-26815# Texas Univ., Austin. Applied Research Labs.
FINITE-AMPLITUDE NOISE, DIFFRACTION OF AN N WAVE BY A CIRCULAR APERTURE, AND VERTICAL PROPAGATION OF FINITE AMPLITUDE WAVES IN THE OCEAN Final Report, 30 Apr. 1973 - 30 Jun. 1974
David T. Blackstock 13 Sep. 1974 20 p refs
(Contract N00024-72-C-1380; SF11111)
(AD-A004649; ARL-TR-74-38) Avail: NTIS CSCL 20/1

Basic research on finite amplitude sound waves has been carried out during 1973-74. The following three separate projects are summarized: propagation of finite-amplitude noise, diffraction of an N wave by a circular aperture, and propagation of plane waves of finite amplitude in inhomogeneous media with applications to vertical propagation in the ocean. GRA

N75-26816# Naval Research Lab., Washington, D.C.
ACOUSTIC TRANSMISSION LOSS BY SINGLE PROFILE RAY TRACING (PROGRAM RTRACE) Interim Report
Evan B. Wright 23 Dec. 1974 71 p refs
(NRL Proj. S01-36)
(AD-A003908; NRL-7815) Avail: NTIS CSCL 20/1

A program called RTRACE for the calculation of underwater acoustic transmission loss by ray tracing and summation has been written for NRL's CDC-3800 computer. RTRACE uses a single-profile, flat-bottom model of the medium with an inverse quadratic function of depth to interpolate in the sound-speed profile. Random- or coherent-phase intensities may be calculated and results may be printed or plotted, along with detailed ray histories and a ray trajectory plot. GRA

N75-26817# Naval Research Lab., Orlando, Fla. Underwater Sound Reference Div.
FLOW-GENERATED NOISE OF A CYLINDRICAL HYDROPHONE
T. A. Henriquez 15 Jan. 1975 10 p refs
(NRL Proj. S02-31)
(AD-A004162; NRL-MR-2974) Avail: NTIS CSCL 17/1

A procedure for measuring water-flow-generated noise in the USRD type H62 hydrophone has been developed. The hydrophone was towed through water at a constant speed of 1 knot to simulate deep-ocean currents, and noise spectra were obtained with spectrum analyzer and averager equipment in the frequency range 0 to 1000 Hz. As much as 10 db increase in noise was induced by the 1-knot water flow. GRA

N75-26818# SACLANT ASW Research Center, La Spezia (Italy).
SOUND PROPAGATION IN SHALLOW WATER, VOLUME 2: UNCLASSIFIED PAPERS
Ole F. Hastrup and Ole V. Olesen 15 Nov. 1974 273 p refs
Conf. held at La Spezia, Italy, 23-27 Sep. 1974
(AD-A004805; SACLANTCEN-Conf-Proc-14) Avail: NTIS CSCL 17/1

The conference reported here was planned by SACLANTCEN to improve the understanding of shallow-water problems within NATO and the NATO nations by discussing the following subjects: Propagation, reverberation and ambient noise, acoustic modeling, sonar performances, and operational and systems aspects. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-26819 Pennsylvania State Univ., University Park.
REACTIONS OF METAL ATOMS WITH SELECTED SUBSTRATES Ph.D. Thesis
Leslie Raymond Wolf 1974 155 p
Avail: Univ. Microfilms Order No. 75-12727

The codeposition technique was used to study the reactions of aluminum, iron and copper atoms with a variety of substrates, primarily organic compounds. Codeposition was performed by simultaneously depositing metal vapor and substrate vapor on a surface cooled with liquid nitrogen. Aluminum atoms react with alkenes by addition across the double bond. Reactions with alkadienes and alkynes occur in a similar fashion. The reaction with bromoethane produces ethylaluminum sesquibromide. Codeposition with water or ammonia generates hydrogen at liquid nitrogen temperatures and upon warming. They do not produce stable compounds when codeposited with benzene or trimethylsilane. Iron atoms can be stabilized at low temperatures by codeposition with arenes or 1,3-butadiene. Codeposition of iron atoms and 1-butyne forms a complex which, upon warming, polymerizes the substrate. Copper atoms generate hydrogen when codeposited with hydrogen bromide. They also dehalogenate organic halides, but only a small yield is obtained. Dissert. Abstr.

N75-26820 Minnesota Univ., Minneapolis.
LOW ENERGY ELECTRON IMPACT SPECTRA OF SOME SATURATED HYDROCARBONS Ph.D. Thesis
Kangjin Kim 1974 252 p
Avail: Univ. Microfilms Order No. 75-12095

An electron impact spectrometer was constructed to study forward angle scattering of electrons in the energy range of 10 to 80 eV. Impact spectra are reproduced for a variety of saturated

hydrocarbons at 0 deg scattering angle and 50 eV. Major findings show that: (1) the oscillator strength distributions obtained from forward scattering of 50 eV electrons agree with the distributions obtained from photon absorption for the allowed transitions with energies up to about 12 eV, (2) weak transitions were located in the energy region from about 7.5 to 8.5 eV in n-alkanes and their single-branched derivatives, (3) the first three transitions observed in n-alkane and singly branched alkane spectra appear to be predominantly C-C excitations on the basis of their systematic variation with number of carbon atoms and finally (4) no evidence was found in forward scattering for any transitions in the energy region where fluorescence was reported. Dissert. Abstr.

N75-26821 Oregon State Univ., Corvallis.
THE ROTATIONAL MOTION OF MOLECULES IN CRYSTALLINE SOLIDS Ph.D. Thesis
Ralph Edward Miller 1975 168 p
Avail: Univ. Microfilms Order No. 75-13064

The group theory is solved for molecules of any symmetry matrix isolated at a site in a crystal field of any symmetry. As the potential barrier to rotation of the molecule relative to the host crystal is raised, certain symmetry operations become decreasingly feasible in the sense of Longuet-Higgins. Using correlation methods the symmetry species of the rotational states are determined from the free rotation limit to any of the librational limits. Examples of linear, symmetric, spherical, and asymmetric rotors are given. From the symmetry of states and the dipole and polarizability tensors, selection rules are applied to predict spectra in the infrared and Raman effect. Raman studies are reported for methane isolated in noble gas matrices and the low temperature crystal phases of neat methane which give additional support to the evidence for rotation and the James-Keenan model for the lowest temperature phase of neat CH4.
Dissert. Abstr.

N75-26822*# Scientific Translation Service, Santa Barbara, Calif.
THE MAGNETIC MOMENT OF THE PROTON
B. G. Lasarew and L. W. Schubnikow Washington NASA Jun. 1975 17 p refs Transl. into ENGLISH from Physik. Z. Sowietunion (Kharkov), v. 11, 1937 p 445-457
(Contract NASw-2483)
(NASA-TT-F-16426) Avail: NTIS HC $3.25 CSCL 20H

The magnetic susceptibility of solid hydrogen was measured at the temperatures 4.22, 2.18 and 1.76 deg absolute, and it was established that the diamagnetic susceptibility of hydrogen decreases at these temperatures. This decrease is ascribed to the increase of the paramagnetism due to the magnetic moment of the proton. The magnetic moment of the proton, muon sub p was calculated from the temperature curve of the susceptibility. The values muon sub p = 2.3 + or - 10% nuclear magnetons and muon sub p = 2.7 were obtained with an error of less than 10%. The possibility of measuring the nuclear magnetism by the susceptibility demonstrates that the equilibrium between the field and the hydrogen nucleus must be established rapidly.
Author

N75-26823# Amsterdam Univ. (Netherlands).
ENERGY DISTRIBUTIONS OF SPUTTERED NEUTRALS AND ELECTRON TRANSFER AND REACTIVE IONIZATION IN ATOM-MOLECULE COLLISIONS Ph.D. Thesis
Guenther Peter Koennen 18 Sep. 1974 100 p refs
Avail: NTIS HC $4.75

The extension of hyperthermal atomic beams to nonalkaline systems is reported. Data cover: (1) energy distributions of particles sputtered from solids and detection possibilities of hyperthermal neutrals, and (2) ionizing atom-molecular collisions in the electron-volt energy range. Energy distribution models and negative surface ionization detection are discussed. E.H.W.

N75-26824# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
RADIATION FROM HYDROGEN-ARGON MIXTURES Physical Sciences Research Papers
A. G. Rubin, A. Besse, and A. Cohn 18 Oct. 1974 18 p refs (AF Proj. 8600)
(AD-A003646; AFCRL-PSRP-606; AFCRL-TR-74-0522) Avail: NTIS CSCL 07/4

The emission of short wavelength visible light from argon-hydrogen mixtures irradiated by a pulsed 1.7 MeV electron beam has been studied, as well as the absorption of 4416A radiation in the mixture. Absorption was found to increase faster than linearly with increased argon pressure. A new multipass gain or absorption measuring technique was devised which measures small amounts of gain with high sensitivity. At the highest excited state density obtained, 3 x 10 to the 13th power /cc, the absorption in argon-hydrogen mixtures is positive. GRA

N75-26825# Technische Universitaet, Munich (West Germany). Inst. fuer Physikalische Chemie.
DIRECT TIMING OF LIFETIMES OF VIBRATIONALLY EXCITED MOLECULES BEFORE DECAY BY RADIATION, INTERSYSTEMS CROSSING, OR COLLISIONS. HIGH RESOLUTION LIFETIME MEASUREMENTS Final Report, 2 Nov. 1971 - 31 Jul. 1974
E. W. Schlag 1974 7 p
(Grant AF-AFOSR-2181-72; AF Proj. 9538)
(AD-A003745; AFOSR-75-0025TR) Avail: NTIS CSCL 07/4

A method was developed for correlating phase excitation with a response of single photons. The correlation spectrometer was constructed in conjunction with a xenon light source and a monochromator. The limiting resolution comensurate with adequate signal strength was 10 reciprocal centimeters. A new method was initiated to enable one to make high resolution measurements of dynamic processes. High resolution was here defined as being in the picometer range, i.e., limited only by the Doppler profile of the line, analogous to the high resolution spectral information now available. A laser was constructed which could be narrowed and doubled to meet the needed requirements. The tunable dye laser was of the flash pumped design, and it was further decided to measure all absorption and emission parameters for each individual flash, employing a variable length folded path cell. In this way all kinetic parameters were determined. GRA

N75-26826# Aerospace Corp., El Segundo, Calif.
THE EFFECT OF VIBRATIONAL ENERGY ON THE REACTION OF MOLECULAR HYDROGEN WITH ATOMIC OXYGEN Interim Report
John H. Birely, Jerome V. V. Kasper, Francis Hai, and Lane A. Darnton 11 Dec. 1974 34 p refs
(Contract F04701-74-C-0075)
(AD-A003757; TR-0075(5270-20)-1; SAMSO-TR-74-256) Avail: NTIS CSCL 07/4

A summary is given of results obtained in the O H2(*) experiment to study the effect of vibrational excitation of molecular hydrogen at approximately 300K translational temperature on the production of vibrationally excited hydroxyl radicals. A preliminary upper bound of 6 x 10 to the 10th power cc/mole-sec on the rate constant for this process has been deduced from laboratory observations and detailed kinetic calculations by use of the Aerospace NEST program. This result implies that vibrational excitation alone cannot accelerate the rate of the O + H2 reaction by the amount needed to explain the large OH(*) radiance observed in field measurements on the plume of a missile that employs a noncarbon-containing fuel. Also, it can be shown that no more than 30% of the vibrational energy of H2 is available to overcome the activation energy for the overall O + H2 reaction. Methods of improving the accuracy of the authors: determination of the rate constant for the O + H2(*) reaction are discussed. GRA

N75-26827# Aerospace Corp., El Segundo, Calif.
EMPIRICAL CORRELATION AND COMPARISON OF V-V TRANSFERS INVOLVING THE HYDROGEN HALIDES Interim Report
Jerry F. Bott 7 Jan. 1975 35 p refs
(Contract F04701-74-C-0075)
(AD-A004073; TR-0075(5530)-3; SAMSO-TR-74-287) Avail: NTIS CSCL 07/4

The author presents an empirical correlation of room temperature data for V-V energy exchanges between the hydrogen halides and several groups of molecules. The probabilities for exothermic energy exchange between two hydrogen halide molecules are correlated along a single line when they are normalized by the squares of the permanent dipole moments and plotted versus the fraction of initial vibrational energy converted to rotational or translational energy in the exchange.

The normalized probabilities for hydrogen halide V-V exchanges with CO and CO2 fall along similar but separate lines. The data for V-V exchanges between hydrogen halides and homonuclear molecules are correlated by plotting the exchange probabilities versus the energy fraction converted in the exchange. The correlation of such data makes it possible to estimate other unmeasured exchange probabilities and the contributions of double-quantum transitions. GRA

N75-26828# Wayne State Univ., Detroit, Mich.
ENDOR STUDIES OF RADIATION-PRODUCED TRAPPED ELECTRONS AND RADICALS Final Report, 1 Sep. 1971 - 31 Aug. 1974
Larry Kevan 1 Nov. 1974 13 p
(Contract DA-ARO(D)-31-124-71-G180)
(AD-A004023; ARO-9999.12-C) Avail: NTIS CSCL 07/4

ENDOR has been applied to radiation-produced trapped electrons and radicals in glassy, polymer and polycrystalline disordered matrices. Abstracts of 11 publications and titles of 30 scientific talks on these topics are given. The emphasis has been to develop new methods for the application of ENDOR to disordered systems. GRA

N75-26829# Aerospace Corp., El Segundo, Calif.
ELECTRONIC EXCITATION IN COLLISIONS OF H AND H(PLUS) WITH O2 Interim Report
John H. Birely 27 Dec. 1974 32 p refs
(Contract F04701-74-C-0075)
(AD-A004074; TR-0075(9270-01)-3; SAMSO-TR-75-1) Avail: NTIS CSCL 07/4

The 115-750 nm radiation produced in collisions of 1.5-25 keV H(+) and H with O2 has been studied in an atomic beam experiment under thin-target conditions. Both for ion and neutral impact, the first negative (1N) and second negative (2N) band systems of O2(+) are the most intense spectral features. Also observed are several emissions from excited states of O and O(+). Relative cross sections for individual bands of the O2(+)1N system, were used to show that the vibrational population formed in both H(+) and H impact is in good agreement with the predictions of a simple Franck-Condon mechanism over the 2-25 keV energy range. Total cross sections for formation of O2(+) electronic states are discussed. GRA

N75-26830# Northwestern Univ., Evanston, Ill. Dept. of Mechanikal Engineering and Astronautical Sciences.
INVESTIGATION OF ATOMIC AND MOLECULAR CLUSTERS FORMED IN FREE JET EXPANSION VIA GAS PHASE NUCLEATION Final Report, 16 Mar. 1973 - 31 Aug. 1974
Gilbert D. Stein 15 Nov. 1974 27 p refs
(Contract F19628-73-C-0226; AF Proj. 7635)
(AD-A004137; AFCRL-TR-74-0615) Avail: NTIS CSCL 07/4

The goal of the work outlined here is to determine the structure of atomic and molecular clusters small enough to constitute the starting or critical size for phase transitions from the vapor state (i.e., 10-100 molecules/cluster). The clusters are nucleated homogeneously from the vapor phase in the free jet expansion of a molecular beam apparatus. Their size and structure are obtained through use of high energy electron diffraction. GRA

N75-26831# Texas Univ., Austin. Dept. of Chemistry.
PREDICTION OF PROPERTIES AND BEHAVIOR OF MATERIALS Final Scientific Report
Michael J. S. Dewar 1974 31 p refs
(Contract F44620-71-C-0119; AF Proj. 9538)
(AD-A003698; AFOSR-74-1916TR) Avail: NTIS CSCL 07/4

A semiempirical SCF MO treatment (MINDO/3) has been developed which for the first time seems to allow mechanisms of organic reactions to be predicted in greater detail and with more certainty than could be achieved by experiment, and at much less cost. Calculations for a number of reactions have already led to novel and unexpected mechanism conclusions of major importance. In this connection experimental work has also been carried out on the Cope and Cornforth rearrangements. A high resolution photoelectron spectrometer has been constructed and used to study a variety of organic and organometallic compounds. A number of new nematic liquid crystals have been prepared and novel conclusions reached concerning the effect of structure on mesophase stability. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N75-26832# Rochester Univ., N.Y. Nuclear Structure Research Lab.
[NUCLEAR STRUCTURE] Annual Report, 1974
1974 218 p refs
Avail: NTIS HC $7.25

Ion nuclear transfer reactions studies involve nuclear shape, statistical properties, multiple step processes, and coulomb nuclear interference. For individual titles, see N75-26833 through N75-26840.

N75-26833 Rochester Univ., N.Y.
NUCLEAR STRUCTURE: sd SHELL
In its Nucl. Struct. 1974 p 1-49 refs (For availability see N75-26832 17-73)

Ion induced alpha particle transfer studies on sd shell structure cover the reactions of (Li-6,d), (o-16,C12), Mg-25(d,Li-6), (He-3,n), and some single nucleon transfer reactions to extract spectroscopic information. Detailed comparisons of theoretical predictions with experimental results are obtained by using the SU sub 3 model; reactions involve multistep processes of unnatural parity levels and their populations. G.G.

N75-26834 Rochester Univ., N.Y.
NUCLEAR STRUCTURE 40 LESS THAN A LESS THAN 90
In its Nucl. Struct. 1974 p 50-91 refs (For availability see N75-26832 17-73)

The (Li-6,d) reaction as applied to fp shell nuclei is studied extensively for 40 smaller than A smaller than 90. Many angular distributions from (Li-6,d) fp shell target nuclei have been fitted with simple zero range alpha cluster transfer calculations. An analysis of the ground state transition with the finite range exact recoil DWBA code demonstrates agreement between alpha transfer reactions and both, theoretical spectroscopic ratios and alpha decay data. Statistical and experimental light ion induced inelastic scattering and nucleon transfer reactions for calcium, vanadium and chromium isotopic structures are included. G.G.

N75-26835 Rochester Univ., N.Y.
NUCLEAR STRUCTURE, A GREATER THAN 100, ROTATIONAL EFFECTS
In its Nucl. Struct. 1974 p 92-121 refs (For availability see N75-26832 17-73)

Spins and parities of excited states in Ba-126,-128 nuclei are determined by measurements of angular distributions and linear polarizetions of gamma rays. Similarity in excitation energies suggests similar structure and the same spin and parity assignments for the two nuclei. Two-quasiparticles plus rotor bandmixing calculations of rotation alignment and backbending in several nuclei, and determination of the gyromagnetic ratio of a high spin state are used to identify a number of nanosecond isomers. Light ion induced inelastic scattering and transfer reactions on Z greater than or equal to 76 nuclei are used to observe shape isomeric effects, distribution of octupole strength in ground states, and to assign rotational bands. G.G.

N75-26836 Rochester Univ., N.Y.
REACTION MECHANISMS INVOLVING HEAVY IONS
In its Nucl. Struct. 1974 p 122-149 refs (For availability see N75-26832 17-73)

The reaction mechanism induced by heavy ion impact on heavy target nuclei is shown to produce strongly damped collisions that represent a major fraction of the total reaction cross section in terms of Coulomb nuclear interference. G.G.

N75-26837 Rochester Univ., N.Y.
NUCLEAR SHAPES
In its Nucl. Struct. 1974 p 150-158 refs (For availability see N75-26832 17-73)

Sum rule techniques are used to analyze E frame data for the shapes of nuclear charge distribution for any assumed radial shape of E lambda transition density. Coulomb excitation measurements determine quadrupole moments and transition probabilities in isotope excited states. G.G.

N75-26838 Rochester Univ., N.Y.
ELASTIC SCATTERING
In its Nucl. Struct. 1974 p 159-181 refs (For availability see N75-26832 17-73)

Optical potentials are determined for the elastic scattering of Li-6 by Ni-60 by statistical evaluation of reaction data on numerous targets ranging in mass from 40 to 90. Different Li-6 optical potentials for ground- and first-excited state transitions are illustrated. Optical model and Fresnel interpretations of elastic scattering data in heavy ion interactions with heavy target nuclei show good agreement. A general model is formulated for a nuclear equilibrium process that permits the calculation of preequilibrium decay spectra for alpha induced reactions by assuming a quasi-free cluster nucleon scattering mechanism. A muon decay electron detecting technique is used to make measurements of the muon-mesic lifetimes of Th-232 and U-238. G.G.

N75-26839 Rochester Univ., N.Y.
INSTRUMENTATION
In its Nucl. Struct. 1974 p 182-195 refs (For availability see N75-26832 17-73)

A modified on-line computerized data acquisition system for the multichannel analyzer interface is illustrated that permits over 2 x 1 million counts per channel. Also reported are a heavy ion detector counter, suitable for the detection of heavy ions in the focal plane of a magnetic spectrograph, and the properties of gas cells for nuclear reaction studies on gaseous targets. G.G.

N75-26840 Rochester Univ., N.Y.
ACCELERATOR
In its Nucl. Struct. 1974 p 196-218 refs (For availability see N75-26832 17-73)

The accelerator upgrading program involved installation of new acceleration tubes and resistors. Experimental work was carried out at terminal voltages up to 10.3 MV. Running peak time at 4 to 4.5 MV was primarily used for (d,p) experiments, and the peak at 5 to 5.5 MV for (He-3,n) measurements by pulsed beam system. G.G.

N75-26841# Northeastern Univ., Boston, Mass.
MEASUREMENT OF PSI(3.1) MESON PRODUCTION BY PIONS AND PROTONS
G. J. Blanar, C. F. Boyer, W. L. Faissler, D. A. Garelick, M. W. Gettner, M. J. Glaubman, J. R. Johnson, H. Johnstad, M. L. Mallary, and E. L. Pothier 7 Jul. 1975 10 p refs
(Grant NSF MPS-70-02059-A5)
(NUB-2262) Avail: NTIS HC $3.25

The production of psi (3.1) mesons is reported for the reactions pion(-) + Fe yields muon(+) + muon (-) + anything, at 200 GeV, and p + fe yields muon(+) + muon (-) anything, at 240 GeV. For psi production, distributions in x=P sub L/P sub beam and P sub 1 are given. For x greater than or equal to 0.5, the ration of the psi production cross section in iron for pions to that for protons is found to be 7.4 + or - 2.0. Author

N75-26842*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CYCLOTRON SIDE BAND EMISSIONS FROM MAGNETOSPHERIC ELECTRONS
Kaichi Maeda May 1975 19 p refs Submitted for publication
(NASA-TM-X-70914; X-602-75-121) Avail: NTIS HC $3.25 CSCL 20H

Very low frequency emissions with subharmonic cyclotron frequency from magnetospheric electrons were detected by the S(3)-A satellite (Explorer 45) whose orbit is close to the magnetic equatorial plane where the wave-particle interaction is most efficient. These emissions were observed during the main phase of a geomagnetic storm in the nightside of the magnetosphere outside of the plasmasphere. During the event of these side-band emissions, the pitch angle distributions of high energy electrons (greater than 50 keV) and of energetic protons (greater than 100 keV) showed remarkable changes with time, whereas those of low energy electrons and protons remained approximately isotropic. In this type of event, emissions consist essentially of two bands, the one below the equatorial electron gyrofrequency, and the other above. The emissions below are whistler mode, and the emissions above are electrostatic mode. Author

N75-26843# Institut fuer Festkoerpermechanik, Freiburg (West Germany).
SHOCK WAVES AS POSSIBLE CAUSES OF DAMAGE TO NUCLEAR REACTOR COMPONENTS Interim Report
S. Winkler and G. Sperl Dec. 1974 64 p refs In GERMAN; ENGLISH summary
(WB-8/74) Avail: NTIS HC $4.25

Associated with extreme loading of a nuclear power plant there is a danger of strong shock waves arising in components of the plant. Under certain circumstances these are capable of producing damage in the interior of the shock loaded part ranging from a few microcracks up to total fragmentation of the component. This report deals with an experimental investigation of the interaction of shock waves with typical reactor materials - especially the commonly used steel 22 Ni Mo Cr 3 7, together with an examination of the nucleation of cracks in the materials using metallographic methods. Author (ESRO)

N75-26844# Aerospace Corp., El Segundo, Calif. Lab. Operations.
SPECTRAL CHARACTERIZATION OF PULSED ELECTRON BEAMS WITH ENERGIES BELOW 60 keV BY CALORIMETRIC TRANSMISSION MEASUREMENTS THROUGH THIN ALUMINUM FOILS Interim Report
Wendel M. Graven 11 Dec. 1974 36 p refs
(Contract F04701-74-C-0075)
(AD-A003756; TR-0075(5250-30)-4; SAMSO-TR-74-254) Avail: NTIS CSCL 20/7

Energy spectra have been determined for a pulsed source of electrons with energies below 60 keV. Measurements of fluence transmission through 0.75-micrometer thick aluminum foils were made with a 12-element calorimeter. Each element was covered with a different number of foils to obtain a complete transmission profile from a single pulse. Spectra unfolded from the transmission profiles were compared with those obtained from diode voltage and current data recorded during the pulse. Agreement of the spectra determined by these two independent methods substantiates the diagnostic methods currently used for low-energy pulsed electron beams. GRA

74 OPTICS

Includes light phenomena.

N75-26845 Northwestern Univ., Evanston, Ill.
STATISTICAL ASPECTS OF OPTICAL WAVE PROPAGATION THROUGH A TURBULENT ATMOSPHERE Ph.D. Thesis
Fatma Kavala 1974 270 p
Avail: Univ. Microfilms Order No. 75-28658

A treatment is presented of optical wave propagation in a random medium based on the theory of the structure of atmospheric turbulence. Pulsed plane wave propagation through a finite turbulent layer, monochromatic Gaussian beam wave propagation in a localized smoothly varying turbulence, temporal frequency spectra of a Gaussian beam at two frequencies, the polarized and depolarized field fluctuations due to a finite arbitrary transmitting aperture (which led into the optimization problem in optical communication systems) are considered. In all cases, the method of smooth perturbations (Rytov's method) was applied to the time-dependent stochastic wave equation to obtain expressions for the turbulence-induced log-amplitude and phase fluctuations. These expressions were used to calculate various

statistical quantities such as spatial, temporal and frequency covariance functions. Dissert. Abstr.

N75-26846*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

MAS2-8 RADAR AND DIGITAL CONTROL UNIT

J. Michael Oberg and Fawwaz T. Ulaby Oct. 1974 99 p refs (Contract NAS9-10261)

(NASA-CR-141867; RSL-TR-177-37) Avail: NTIS HC $4.75 CSCL 20F

The design of the MAS 2-8 (2 to 8 GHz microwave-active spectrometer), a ground-based sensor system, is presented. A major modification in 1974 to the MAS 2-8, that of a control subsystem to automate the data-taking operation, is the prime focus. The digital control unit automatically changes all system parameters except FM rate and records the return signal on paper tape. The overall system operation and a detailed discussion of the design and operation of the digital control unit are presented. Author

N75-26847# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

SOME NEW RESULTS ON PROPAGATION OF ELECTROMAGNETIC WAVES IN STRONGLY TURBULENT MEDIA Physical Sciences Research Papers

Ronald L. Fante 14 Nov. 1974 21 p refs

(AF Proj. 2153)

(AD-A003642; AFCRL-PSRP-610; AFCRL-TR-74-0570) Avail: NTIS CSCL 20/6

In the report the author presents new results for the covariance of the intensity fluctuations of a plane wave propagating in a strongly turbulent medium, and evaluates the consequences of these new results on aperture averaging, angle of arrival fluctuations, and the temporal frequency spectrum of the intensity scintillations. The differences between the strong turbulence cases and the weak turbulence cases are generally quite significant. GRA

N75-26848# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

CALCULATIONS OF THE FREQUENCY DEPENDENCE OF ELASTO-OPTIC CONSTANTS OF INFRARED LASER WINDOW MATERIALS Physical Sciences Research Papers.

Bernard Bendow and Peter D. Gianino 24 Oct. 1974 110 p refs

(AF Proj. 3326)

(AD-A003621; AFCRL-PSRP-608; AFCRL-TR-74-0533) Avail: NTIS CSCL 20/6

Stress-induced birefringence may severely degrade or limit the optical performance of infrared transmitting materials, especially in high power laser applications. Thus, prediction of this phenomenon is essential for the appropriate selection of high power IR laser window materials for numerous applications. In this report a detailed first-principles calculation of the elasto-optic, or strain-optic, constants p sub ij is carried out for the first time throughout infrared frequencies, employing a recent theory of Humphreys and Maradudin. For ionic crystals, a Born-Mayer interatomic potential is used, while for semiconductors a Morse potential is used. Two methods for obtaining the p sub ij are applied: one incorporates parameters based on standard thermodynamic prescriptions, the other combines these same parameters with additional ones derived from pressure-dependent data. For both cases, the dispersions in the p sub ij, as well as in the thermal lensing parameters, are calculated throughout the IR regime for a wide variety of rocksalt- and zinc blende-structure compounds. GRA

N75-26849# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.

DIFFRACTION. WAVES IN RANDOM MEDIA Final Report, 15 Jan. 1970 - 31 Dec. 1974

Joseph B. Keller Jan. 1975 18 p refs

(Contract N00014-67-A-0467-0015; NR Proj. 371-146)

(AD-A003935) Avail: NTIS CSCL 20/6

The subjects of investigation under the contract can be classified under the two headings Diffraction and Waves in Random Media. In diffraction, various asymptotic methods were devised and applied to numerous wave propagation problems. In waves in random media new limit theorems and perturbation methods were used to get exact results. GRA

N75-26850# Naval Research Lab., Washington, D.C.

DARPA-NRL INTEGRATED OPTICS PROGRAM REPORT TO DEFENSE ADVANCED RESEARCH PROJECTS AGENCY Quarterly Technical Report, 1 Sep. - 1 Dec. 1974

William K. Burns and Thomas G. Giallorenzi Dec. 1974 13 p refs

(DARPA Order 2327; NRL Proj. NO1-38)

(AD-A003496; NRL-MR-2970) Avail: NTIS CSCL 20/6

The ARPA-NRL Integrated Optics program is concerned with the development of infrared integrated optics technology and with the development of a single-mode optical data bus. This report summarizes the NRL in house progress in the area of indiffused LiNbO3 waveguides, separating waveguides for the data bus, and single-mode optical data bus planning. In particular, the results of a theoretical study of separating waveguides are presented. GRA

N75-26851# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.

REFLECTANCE AND EMITTANCE OF SELECTED MATERIALS AND COATINGS Final Report

Martin Donabedian 13 Jan. 1975 58 p refs

(Contract F04701-74-C-0075)

(AD-A004080; TR-0075(5484)-2; SAMSO-TR-75-24) Avail: NTIS CSCL 20/6

A literature review was made to provide the reflective and thermal radiative properties (emittance) of a number of selected materials and surface coatings applicable to a few specific satellites. With the data provided, the infrared radiation signature for each surface may be evaluated from both a spectral and directional basis. Properties defined include solar absorptance, normal and hemispherical emittance, spectral reflectance and emittance, and directional (angular) reflectance and emittance. Pertinent data which aid in predicting degradation of the solar absorptance in the space environment are also presented. The selected materials include aluminum alloy 6061, titanium alloy 6Al-4V, beryllium, various titanium dioxide and zinc oxide pigmented (white) coatings, solar cells, optical solar reflectors (second surface mirrors), using both rigid and flexible substrates, black pigmented coatings, and clear and black anodized aluminum coatings. GRA

N75-26852# Georgia Inst. of Tech., Atlanta. School of Physics.

OPTICAL INTERACTIONS IN SOLIDS RELATING TO SOLID STATE DETECTORS AND CORROSION CONTROL Final Report

James R. Stevenson Nov. 1974 12 p refs

(Contract AF-AFOSR-1892-70; AF Proj. 9763)

(AD-A003743; AFOSR-74-1920TR) Avail: NTIS CSCL 20/6

The optical properties of cadmium arsenide, cadmium phosphide alloys are reported. The infrared characteristics of synchrotron radiation as a possible source for infrared spectroscopy and detector calibration have been studied. The relation of the extreme ultraviolet reflectance to the optical constants generated by a Kramers-Kronig analysis with applications to the cadmium-zinc-arsenide alloy are reported. The results of Auger electron spectroscopy and optical spectroscopy of magnesium-magnesium oxide surfaces are given with possible applications to corrosion studies and optical characterization of surfaces. GRA

N75-26853# Arizona State Univ., Tempe. Engineering Research Center.

DETECTION DEVICES, TECHNIQUE AND THEORY Final Report

Irving Kaufman 22 Oct. 1974 91 p refs

(Contract F44620-69-C-0025; AF Proj. 6813)

(AD-A004174; ERC-R-74018; AFOSR-75-0088TR) Avail: NTIS CSCL 20/12

Contents: Solid State Research Laboratory; Personnel; Publications by participants in Project THEMIS; Research accomplishments--Acoustic waves, holography, semiconductor devices, optical image sensors, display techniques, radiation fields in wave guides; Displays using an array of miniature electron guns; Study of photoconductivity in CdS; Epitaxial deposition of

single crystal films of beta SiC; Semiconductor devices; and Electro-optic ceramics. GRA

N75-26854# Rockwell International Corp., Anaheim, Calif. Autonetics Div.
INVESTIGATION OF ADVANCED PROTECTIVE AND ANTIREFLECTION COATINGS FOR HALIDE OPTICS Final Report, 1 Jun. 1973 - 19 Apr. 1974
Bernard L. Weigand 14 Jun. 1974 16 p
(Contract F19628-73-C-0275; ARPA Order 2415)
(AD-A003631; C73-892.4/201; AFCRL-TR-74-0551) Avail: NTIS CSCL 20/6

A chemical etch procedure using a solution of 91 parts of glacial acetic acid to 9 parts of concentrated hydrochloric acid was developed for polishing the potassium chloride. Thin film polymeric coatings were prepared by radio frequency glow discharge and ultraviolet techniques and proper equipment has been assigned and assembled. Hexachlorobutadiene - 1.3 was used as monomer for preparation of polymeric coatings. Glow discharge polymerization was occuring primarily in the vapor phase rather than on the substrate surface thereby establishing the proper mathematical relationship between the monomer vapor pressure, flow rate, substrate temperature, power, inert gas pressure, flow substrate to-power source spacing and deposition rate. The thin film polymeric coating showed a slight absorption at 10.6 micrometers and little or no absorption at 3 to 5 micrometers. The coating demonstrated good adhesion to the substrate. The very low coating deposition rates obtained by ultraviolet photolytic polymerization of low pressure materials make this process unattractive for this type of materials. GRA

N75-26855# Washington Univ., St. Louis, Mo. Dept. of Physics.
OPTIMUM DETECTION SYSTEMS Final Report
E. T. Jaynes Aug. 1974 10 p refs
(Contract F44620-69-C-0121)
(AD-A004480; AFOSR-75-0097TR) Avail: NTIS CSCL 20/6

This final report is a summary of the effort during the final period of a project on optimum detection systems. The summary is divided into two sections: physics and electrical engineering. Included in the physics section are summary remarks on a quantum noise experiment, a sodium decay experiment, applications of quantum electrodynamics and further developments in the neoclassical radiation theory. The engineering section summarizes the effort on hybrid technology for integrated optics and the interaction of guided optical waves and surface acoustic waves. GRA

N75-26856# Illinois Univ., Urbana. Electromagnetics Lab.
EXCITATION OF AN OPTICAL FIBER BY A GUASSIAN BEAM
Masoud Mostafavi, Tatsuo Itoh, and Raj Mittra Dec. 1974 82 p refs
(Grant DAHC04-74-G-0113)
(AD-A004019; UIEL-74-16; UILU-ENG-74-2559; ARO-12049-4-EL) Avail: NTIS CSCL 20/6

The problem of excitation of an optical fiber at normal incidence by a Gaussian beam is investigated. The authors have investigated two cases: (1) Neglecting the reflection from the end of the fiber, the guided modal powers and the radiated power are calculated. For the case of a truncated plane wave normally incident at the end of the rod, the modal powers are calculated and the results are compared with those of other authors using asymptotic analysis. Satisfactory agreement is found between the two. (2) The contribution of the reflection from the end of the rod is included in the analysis and the simultaneous set of equations obtained is solved numerically for the reflected, guided and radiated modal coefficients and their corresponding powers. The results, which were found to conform with the previous case, are considered satisfactory. GRA

N75-26781 Hughes Aircraft Co., Culver City, Calif.
FORWARD LOOKING INFRARED SYSTEMS
Richard D. Hudson, Jr. and Jacqueline W. Hudson (Arjay Associates, Encino, Calif.) *In* AGARD Electro-Opt. Systems May 1975 12 p refs (For availability see N75-26778 17-70)

N75-26782 Marconi-Elliott Avionic Systems Ltd., Rochester (England).
HELMET MOUNTED SIGHTS AND DISPLAY SYSTEMS
J. T. Shepherd *In* AGARD Electro-Opt. Systems May 1975 13 p (For availability see N75-26778 17-70)

N75-26783 EMI Electronics Ltd., Feltham (England). Ergonomics Lab.
OPTO-ELECTRONIC SYSTEMS: PERCEPTUAL LIMITATIONS AND DISPLAY ENHANCEMENT
A. A. Clarke *In* AGARD Electro-Opt. Systems May 1975 12 p refs (For availability see N75-26778 17-70)

N75-26784 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
TOTAL COCKPIT IMPLICATIONS OF ELECTRO-OPTICAL DISPLAYS
John M. Reising *In* AGARD Electro-Opt. Systems May 1975 16 p refs (For availability see N75-26778 17-70)

N75-26786 Naval Research Lab., Washington, D.C.
OPTICAL FIBER APPLICATIONS
A. Fenner Milton *In* AGARD Electro-Opt. Systems May 1975 21 p (For availability see N75-26778 17-70)

N75-26787 British Aircraft Corp., Warton (England). Military Aircraft Div.
AIRCRAFT DESIGN IMPLICATIONS OF OPTO-ELECTRONIC SYSTEMS
W. I. McFarlane *In* AGARD Electro-Opt. Systems May 1975 22 p (For availability see N75-26778 17-70)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-26857 British Library Lending Div., Boston Spa (England).
AN EXPERIMENTAL STUDY OF ROTATING MHD COUETTE FLOW IN A COPLANAR FIELD
M. M. Gurfink 14 May 1974 10 p refs Transl. into ENGLISH from Magn. Gidrodin., Akad. Nauk Lat. SSR (USSR), no. 2, 1973 p 31-34
(BLL-CE-Trans-6424-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A study of the flow regime of an electrically conducting liquid between coaxial cylinders in a coplanar magnetic field was conducted by using torque measurements. The internal cylinder was rotated, and the torque was determined from the angle of rotation of the external cylinder (which was suspended on three threads). The annular magnetic field was produced by passing a direct current through a rectilinear cylindrical conductor, which was set up coaxially with the working cylinders. The experiments show that in the flow regime the magnetic field does not prevent the formation of a known Taylor vortex flow pattern, but delays it at high Reynolds numbers after a turbulent flow was established. The experimental data approximates a linear dependence of the critical Reynolds number on the Stewart number, from which it follows that at high Reynolds numbers a critical ratio occurs between the Hartman and Reynolds numbers. Author

N75-26858 Illinois Univ., Urbana.
ANALYSIS OF WAVE-PARTICLE INTERACTIONS IN A BEAM PLASMA SYSTEM Ph.D. Thesis
Dan Winske 1974 193 p
Avail: Univ. Microfilms Order No. 75-11803

Several mechanisms were investigated to explain the saturation of the beam plasma instability and the simultaneous broadening of the beam energy distribution function for the case where the beam is cold and weak, and the plasma is cold and collision dominated. One mechanism involves the trapping of the beam in a single spatially growing wave. A set of dynamic equations are integrated numerically. The inclusion of collisions produces several new features: the wave slows down in the

saturation region and part of the beam (20-40%) remains untrapped. An estimate of the importance of collisions between trapped particles using a moment approach shows that the effect of such collisions is negligible. A second mechanism considers the thermalization of the beam by its interaction with random, spatially growing waves. Saturation is achieved when the beam is heated sufficiently, through a process called collisional quenching. Dissert. Abstr.

N75-26859*# Stanford Univ., Calif. Inst. for Plasma Research.
THEORETICAL AND EXPERIMENTAL STUDIES OF SPACE-RELATED PLASMA WAVE PROPAGATION AND RESONANCE PHENOMENA Semiannual Report, 1 Jul. - 31 Dec. 1974
F. W. Rawford Mar. 1975 16 p refs
(Grant NGL-05-020-176)
(SU-IPR-630; SAR-16) Avail: NTIS HC $3.25 CSCL 20I

The testing and refinement of various ideas for space plasma experimentation on the spacelab are dealt with. Special attention was given to whistlers and Alfven wave excitation by electron and proton beams. Data also consider nonlinear wave propagation, long delayed echoes, pulse propagation, and ionospheric heating and back scatter. E.H.W.

N75-26860# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OBSERVATION OF DRIFT MOTION OF A COLLISIONAL PLASMA IN CROSS FIELDS
Altaf Hussain Apr. 1975 27 p refs
(IPPJ-221) Avail: NTIS HC $3.75

The drift velocity of particles undergoing approaching E x approaching B rotation in a collisional plasma is investigated by test wave technique and Langmuir probe. The velocity determined by probe is corrected by including effect of cylindrical geometry and finite Larmor radius effect. From the B dependence of the corrected velocity and the drift velocity determined by test wave, the ion-neutral collision cross section is determined which is found to be in disagreement with the value given by the current data. This disagreement is attributed to an inappropriate collision cross section at low energy at which small angle scattering events are frequent. It is proposed that in events in whivh there is a loss of particle drift velocity, the so-called slowing down cross section should be used, rather than the total cross section. Author

N75-26861# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ION DRIFT VELOCITY MEASUREMENT IN A COLLISIONAL PLASMA
Altaf Hussain, Tsutomu Kuroda, and Genichi Horikoshi Mar. 1975 15 p refs
(IPPJ-216) Avail: NTIS HC $3.25

In a rotating plasma, immersed in crossed electric and magnetic fields, plasma rotation velocity was obtained by determining radial electric field E sub r with a Langmuir probe (including finite Larmor radius effect) and by using a test wave technique. A disagreement between the two velocities is found, and is not removed even if the collisional effects are included in the velocity determined by E sub r. This difference is attributed to the inappropriate collision cross section. It is proposed that at low energies, instead of total collision cross section, the so-called 'slowing down' cross section should be used, and cylindrical effects should be considered. Author

N75-26862# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TWO STREAM INSTABILITY OF QUASIPARTICLES
Akira Hasegawa Apr. 1975 5 p refs
(IPPJ-217) Avail: NTIS HC $3.25

Two (or more) quasimonochromatic waves interacting in a nonlinear dispersive medium are shown to be unstable even if the each wave is modulationally stable. Author

N75-26863# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ROTATIONAL MOTION OF A COLLISIONAL PLASMA CYLINDER IN RADIAL ELECTRIC AND AXIAL MAGNETIC FIELDS
G. Horikoshi, A. Hussain, and T. Kuroda Apr. 1975 17 p refs
(IPPJ-218) Avail: NTIS HC $3.25

An analysis of the motion of collisional plasma cylinder in radial electric and axial magnetic fields is presented. The Boltzmann equation for the plasma motion is expressed in components of cylindrical coordinates. After some simplification of the problem, the Boltzmann equation was reduced to a set of equations of 4th order in V sub r or V sub theta. It is concluded from the results of numerical computation that the cylindrical effect decreases the effective frictional force acting on the rotating plasma (caused by collisions of plasma particles with neutrals). Author

N75-26864# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THEORY OF ENVELOPE SHOCK
Kunioki Mima, Kyoji Nishikawa, and Hiroyuki Ikezi May 1975 12 p refs
(IPPJ-222) Avail: NTIS HC $3.25

A solution is reported which describes a standing electron plasma wave confined in the half-space underdense region with reflected electrons in the other half-space. The shock moves with the ion acoustic speed and the density jump is proportional to the electron wave amplitude. Author

N75-26865# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SELF-PHASE MODULATION OF LASER LIGHT IN LASER PRODUCED PLASMA
C. Yamanaka, T. Yamanaka, J. Mizui, and N. Yamaguchi Feb. 1975 13 p refs
(IPPJ-215) Avail: NTIS HC $3.25

A spectrum broadening due to the self phase modulation of a laser light was observed in the laser produced deuterium and hydrogen plasmas. Qualitative treatments of the density modulation due to the self focusing process and the modulational instability were discussed. The theoretical estimation of spectrum broadening fairly accorded with experimental results. Author

N75-26866# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
CALCULATION OF THE MAGNETOSTATIC FIELD OF COILS AND DETERMINATION OF THE FIELD LINE PATTERN [ZUR BERECHNUNG DES STATIONAEREN MAGNETFELDES VON SPULEN UND DER ERMITTLUNG DES FELDLINIEN-VERLAUFS]
Heribert Kuczera Aug. 1973 67 p refs In GERMAN
(TUM-LRT-TB-4) Avail: NTIS HC $4.25

Some methods for calculating the magnetostatic field of a coil with arbitrary geometry and current distribution are discussed. The objective is simplification of field calculations of linear conical coils used for plasma acceleration and compression. Two analytic methods for certain geometric exceptional cases, a numerical approximation method for the conical coil and an approximation method to determine the field strength and field lines of a simplified model coil, are explained and compared. The calculations and graphical representations were executed with a digital computer and a peripheral plotter. Computer program lists are included. ESRO

N75-26867# Technische Univ., Berlin (West Germany). Inst. fuer Thermo- und Fluiddynamik.
ON THE STABILITY OF CONDUCTING PLANE AND HOLLOW JETS IN A PARALLEL MAGNETIC FIELD Ph.D. Thesis
P. Plaschko Porz, West Ger. DFVLR 15 Nov. 1974 128 p refs In GERMAN; ENGLISH summary
(DLR-FB-74-14) Avail: NTIS HC $5.75; DFVLR, Porz, West Ger. DM 44.70

The stability was investigated of conducting, inviscid plane and axisymmetric hollow jets in a parallel magnetic field surrounded by moving gases. The linearized stability equations were derived allowing variations of the basic flow and the material properties in the direction normal to the boundary. From them it was possible to formulate the transition conditions at a boundary between different media. In the limit of small magnetic Reynolds numbers the electromagnetic field is proportional, and the flow field is independent of the latter. Calculations were performed with spatial and temporal excitations during consideration of the influence of MHD-parameters. Author (ESRO)

N75-26868# Boston Univ., Mass. Dept. of Physics.
THEORETICAL STUDIES ON THE TORMAC GEOMETRY, HYDROGEN PLASMA SPECTROSCOPY AND ELECTRON-MOLECULAR HYDROGEN COLLISIONAL CROSS SECTIONS Final Report, Oct. 1970 - Oct. 1973
Gabor Kalman and Pradip Bakshi Nov. 1974 41 p refs
(Contract F19628-71-C-0079; AF Proj. 8659)
(AD-A004150; AFCRL-TR-74-0621) Avail: NTIS CSCL 20/9

Research results are summarized for work on (I) plasma theoretical problems related to the TORMAC geometry; (II) hydrogen plasma spectroscopy; (III) an electron collisional cross-section computer code and calculations. In Section (I) the following problems are discussed: (1) MHD equilibrium and stability; (2) sheath structure; (3) particle motion in the sheath and particle escape; (4) microinstabilities in the sheath; (5) general principles and scaling. Section (II) deals with the interpretation of experimental results on polarization and spectra of hydrogenic lines from the TORMAC experiment and presents a new and complete theory for the emission of hydrogenic spectra from turbulent plasmas. Section (III) presents results for inelastic scattering of electrons on molecular Hydrogen. GRA

N75-26869# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
STUDIES ON THE SHEATH STRUCTURE IN THE TORMAC GEOMETRY Scientific Interim Report
Gabor Kalman Oct. 1974 42 p refs
(Contract F19628-71-C-0079; AF Proj. 8659)
(AD-A004140; AFCRL-TR-74-0620; SR-3) Avail: NTIS CSCL 20/9

The problem of the self-consistent structure of a current carrying sheath separating the magnetic field from the confined plasma in the TORMAC geometry is investigated. The special feature of the problem is the high shear of the magnetic field. The electrons are treated in the MHD approximation, while the ion trajectories are calculated from the equation of motion. The analogy between the sheath problem and the problem of pseudoparticle moving in a two-dimensional potential is exploited to derive the basic equations of the sheath structure. Various simplified models are investigated. GRA

N75-26870# Massachusetts Inst. of Tech., Cambridge. Aerophysics Lab.
PERFORMANCE AND EVALUATION OF A PLASMA INJECTION WAKES SIMULATOR Scientific Report, 1 Nov. 1973 - 30 Jun. 1974
Charles W. Haldeman, John I. Cofer, and Ross L. Bisplinghoff Aug. 1974 114 p refs
(Contract F19628-72-C-0022; AF Proj. 4642)
(AD-A003669; MIT-TR-189; Scientific-3; AFCRL-TR-74-0413) Avail: NTIS CSCL 20/9

Research extending earlier measurements of the performance of a plasma injection wake simulator is reported. The simulator produces a plasma sheath about a blunted cone cylinder in a conventional M=4 supersonic wind tunnel at equivalent altitudes from 150 to 180 kilofeet. This plasma sheath also forms an ionized wake behind the pylon supported model. Reported near wake recovery temperatures are from 1000 K to over 3000 K with electron densities from 1 to 6 x 10 to the 10th power per cc. Measured Mach number, recovery temperature, and electron density profiles are presented for the simulated wake. These indicate that the simulator should be suitable for its intented purpose of measuring the influence of the ionized near wake on base-mounted microwave antennas. GRA

N75-26871# Florida Univ., Gainesville.
A STUDY OF LONG-LIVED RADIATION PROCESSES ASSOCIATED WITH LASER SUPPORTED PLASMAS Final Report, 15 Dec. 1973 - 15 Sep. 1974
John E. Allen, Jr. and Dennis R. Keefer 1975 37 p refs
(Grant DAHC04-74-G-0072)
(AD-A004021; ARO-12125.1-RTZ) Avail: NTIS CSCL 20/9

An experimental study was made of pulsed laser produced plasmas under various flow conditions. It was hoped that the decay of long lived metastable states could be seen; however, no metastable atoms or molecules were detected. For diatomic gases no molecular species were found, in contrast to results obtained for plasmas produced by continuous wave lasers. Streak and framing photographs were taken and were used to determine plasma structure and absorption wave propagation velocities. GRA

N75-26872# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
SHEAR STABILIZATION OF DRIFT WAVES: A NEW APPROACH
Pradip Bakshi and William Bellew Sep. 1974 31 p refs
(Contract F19628-71-C-0079; AF Proj. 8659)
(AD-A004129; AFCRL-TR-74-0619; SR-2) Avail: NTIS CSCL 20/9

The problem of shear stabilization of drift waves is studied, introducing a new operator method for the solution of the Vlasov equation which allows a more complete determination of the perturbed distribution and density operators. The resulting equations, even when treated in the second order differential equation approximation, lead to modifications in the presently available stability criteria. These methods may prove useful for the study of various instabilities in fusion related confinement systems with strong density and magnetic field variations. GRA

N75-26873# Columbia Univ., New York. Plasma Research Lab.
STRONG SHOCK WAVE HEATING TO FUSION TEMPERATURES IN STRONG MAGNETIC FIELDS
Robert T. Taussig 1975 7 p refs Presented at the US-Australian meeting on Plasma Wave Heating, Sydney, Feb. 1975
(Contract F44620-71-C-0010; AF Proj. 9752)
(AD-A004816; AFOSR-75-0150TR) Avail: NTIS CSCL 20/9

A two-temperature, one-dimensional magnetohydrodynamic model of a collision-dominated plasma with anisotropic transport properties is used to determine the shock structure and MHD piston dynamics for shock wave heating in hydrogen. Ions are heated preferentially in such shocks and in the special case of antiparallel magnetic fields intense ion heating is also found in the MHD piston region. Computations for coaxial electromagnetic shock tube conditions and for the initial stages of belt pinch heating are compared to recent experimental observations. The possible application of this model to solid density plasmas is also discussed. GRA

N75-26874# Naval Research Lab., Washington, D.C.
LASER RADIATION FORCES IN LASER-PRODUCED PLASMAS
John A. Stamper Dec. 1974 21 p refs
(NRL Proj. H02-24; NRL Proj. H02-29)
(AD-A004585; NRL-MR-2962) Avail: NTIS CSCL 20/9

There are two contributions to laser radiation forces acting on the electrons. Transfer of momentum from the fields to the electrons results in a field pressure contribution and occurs whenever there is absorption or reflection. The quiver pressure contribution, associated with electron quiver motion, is due to inhomogeneous fields inducing momentum transfer within the electron system. It is shown that the ponderomotive force does not include the field contribution and does not lead to a general description of macroscopic processes. A theory is discussed which does give a general macroscopic description (absorption, reflection, refraction and magnetic field generation) and which reduces to the ponderomotive force for purely sinusoidal fields in a neutral, homogeneous, nonabsorbing plasma. GRA

N75-26875# Naval Research Lab., Washington, D.C.
LASER SCATTERING SYSTEM ON THE NRL TRITON EXPERIMENT
Kent A. Gerber Jun. 1974 38 p refs
(NRL Proj. 77H02-28B; RR0110941)
(AD-A004624; NRL-MR-2818) Avail: NTIS CSCL 20/9

A detailed description of a working, state-of-the-art laser scattering system as specifically employed on the N.R.L. Triton experiment is given. The design considerations, problems and solutions, calibrations, analysis and general physics involved can be applied in designing a laser scattering system to probe almost any laboratory plasma. GRA

N75-26876# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COLLECTIVE INTERACTIONS IN RAPID THETA-PINCH

T. A. El Khalafavi and V. A. Suprunenko 12 Dec. 1974 25 p refs Transl. into ENGLISH from Fiz. Plazmy Probl. Upravlyaemogo Termoyad. Sin. (Kiev), no. 1, 1971 p 137-150
(AD-A004450; FTD-MT-24-2196-74) Avail: NTIS CSCL 20/9

In this work the microwave radiation from the plasma of the rapid thetatron of the electronic cyclotron harmonics series lying lower than the plasma frequency was observed. The intensity of this radiation increased approximately 100 times when the frequency of the higher harmonic of this series coincided with the upper hybrid frequency. The harmonics with numbers 2, 4 and 8 were most easily excited, but radiation was not observed at fundamental frequency. The intensity of the microwave radiation from the plasma was approximately five orders higher than the thermal level. It was shown that this radiation is caused by plasma oscillations which appear in the central discharge region where conditions of continuous acceleration of electrons by a vortex electric field are satisfied. GRA

N75-26877# Naval Research Lab., Washington, D.C.
AN ACCURATE ECONOMICAL NUMERICAL RADIATION TRANSPORT ALGORITHM
D. G. Colombant and N. K. Winsor Dec. 1974 21 p refs
(NRL Proj. H02-30; NRL Proj. H02-27e)
(AD-A003458; NRL-MR-2946) Avail: NTIS CSCL 20/9

A multidirection radiation transport algorithm is described and tested. It numerically constructs solutions of the steady-state radiation transport equation which propagate radiation in straight lines through optically thin regions, and accurately model the absorption of radiation in regions where the opacity may become very large. Tests are performed for external and internal sources in homogeneous or inhomogeneous media. The results are compared with analytical results and with the Milne and Schwarzschild approximations. The algorithm is shown to be superior to both approximations, in many cases, for both thin and thick cases. GRA

N75-26878# Naval Research Lab., Washington, D.C.
INTERACTIONS OF RELATIVISTIC ELECTRON BEAMS WITH HIGH-ATOMIC-NUMBER PLASMAS
David Mosher Dec. 1974 49 p refs
(NRL Proj. 77H02-26A)
(AD-A003460; NRL-MR-2959) Avail: NTIS CSCL 20/9

A relativistically-correct Fokker-Planck analysis is used to develop fluid equations which model the interaction of relativistic electron beams with high atomic-number plasmas. The derived collision terms can be used to describe scattering and energy in materials ranging from the solid to high-temperature plasma forms. The full set of equations discussed can be used to study electron-beam-initiated pellet-fusion in a completely self-consistent fashion. Specifically, the model is applicable to study of beam pinching in plasma-filled diodes, the interaction of focussed beams with target plasmas, and the transport of high nu/gamma beams in high atomic-number plasmas. Although the general equations are amenable to solution only by computational techniques, analytic solutions describing the time-dependent, collisional interaction of a beam in an infinite plasma, and the one-dimensional equilibrium of a beam in a plasma with applied electric field have been obtained. GRA

N75-26879# Massachusetts Inst. of Tech., Cambridge.
STUDY OF CHARGED CONDENSING CESIUM AMALGAM VAPOR JET Interim Report, Apr. - Jul. 1972
Stanley L. Milora Nov. 1974 201 p refs
(Contract F33615-72-C-1258; AF Proj. 7116)
(AD-A004813; ARL-74-0129) Avail: NTIS CSCL 10/2

A study of the production and charging of a cesium-amalgam colloid was undertaken in order to ascertain the feasibility of its use in a high temperature two fluid electro-fluid dynamic power system. Light scattering techniques were applied to the study of the condensation process in a cesium-amalgam vapor jet upon mixing with a cold nitrogen background gas. GRA

N75-26880# Avco-Everett Research Lab., Everett, Mass.
PRODUCTION OF HIGH DENSITY UNIFORM PLASMAS Final Report
Nov. 1974 65 p refs
(Contract F44620-70-C-0023; AF Proj. 6813; AF Proj. 9752)
(AD-A004856; AFOSR-75-0210TR) Avail: NTIS CSCL 20/9

The electron beam sustainer method of generating a stable high pressure gas discharge is investigated experimentally and analyzed theoretically. The important electron loss processes in this type of discharge are recombination and attachment. Electron ion recombination rates have been measured in N2 and mixtures of He:N2:CO2. The effect of electron molecule dissociative attachment on discharge stability is measured experimentally and calculated theoretically. The attachment instability discovered under this program is described and the processes leading to discharge instability and arcing are discussed. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-26881 British Library Lending Div., Boston Spa (England).
FRONT LINE OF PHYSICS
B. Wul and A. Shotov [1974] 3 p Transl. into ENGLISH from Pravada (Moscow), 2 Apr. 1974
(BLL-M-23503-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Research conducted on semiconductors, electron holes, interaction of matter with strong electric files, and luminous fluxes is reported. The tunnel effect in semiconductors is also discussed. M.J.S.

N75-26882 Illinois Univ., Urbana.
THE SUPERCONDUCTING PENETRATION DEPTH IN THIN FILMS OF LEAD Ph.D. Thesis
Harold Richard Kerchner 1974 174 p refs
Avail: NTIS Avail: Univ. Microfilms Order No. 75-11794

The attenuation of an axial magnetic field by cylindrical thin films of superconducting lead and the normal-state resistance of the same films were measured. The magnetic field was measured by using a superconducting magnetometer. From the temperature dependence of the normal-state resistance, the film thickness and the electron mean free path were determined. From the field attenuation, the film thickness, and the mean free path, the superconducting conductivity, the London penetration depth, and penetration depth, which would be expected for pure, bulk lead are derived. In order to interpret the field-attenuation measurements, it is important to know the value of the electromagnetic coherence length as a function of temperature. To this end and to compare the experimental results with theory, the coherence length and the superconducting conductivity at finite temperatures were calculated by using the strong-coupling theory of superconducting lead. Dissert. Abstr.

N75-26883 Stanford Univ., Calif.
INELASTIC NEUTRON SCATTERING FROM TYPE 2 SUPERCONDUCTORS Ph.D. Thesis
Richard Arthur Sacks 1975 98 p
Avail: Univ. Microfilms Order No. 75-13591

The scattering of neutrons by a type-II superconductor in the mixed state was treated using Fetter's quantized hydrodynamic theory for the superfluid vortex lattice. Maki's first-order calculation, which involved a single vibrational quantum in a lattice of rigid vortices, predicted a series of quadratic singularities in the inelastic cross section. This divergence is shown to arise from the first-order expansion and is therefore unphysical. A treatment to all orders in the lattice displacements shows that the neutron propagator is renormalized by the emission and absorption of equivalent lattice quanta, and the renormalization effect eliminates Maki's singularity. The resulting cross section consists of a series of a negligibly broadened elastic Bragg peaks and contains no information about the lattice dynamics. Inclusion of the bending modes of lattice excitation modifies this result and offers the hope of testing Fetter's description. Dissert. Abstr.

N75-26884 Polish Academy of Sciences, Warsaw.
GEOMETRIC THEORY OF THERMOELASTICITY AND CONTINUOUS DISTRIBUTION OF DISLOCATIONS

Milan Micunovic 23 Nov. 1974 98 p refs
Avail: Issuing Activity

The thermoelastic deformation process for a body with continuous distribution of dislocations is analyzed. The basic concepts of deformation processes are first defined. Different approaches to geometrical analysis, kinematical relations for thermal and elastic deformation rates, and an alternative set of constitutive relations are presented. The nonlinear compatibility conditions for thermally anisotropic and isotropic materials are discussed. Consideration of the above factors is then extended to include the continuous distribution of dislocations. Basic configurations and the corresponding deformations are explained. Strain tensor, dislocation, and restrictions on geometry are discussed. The kinematics of thermo-elasto-plastic deformation with a discussion of special cases is presented. The constitutive relations for bodies with stationary dislocations are derived. The field equations necessary for solving the above problem are discussed. Second order and linear approximation are performed. The solution for the stationary isotropic linear case and the derivation of linearized compatibility conditions are given. Author

N75-26885# Eidgenossische Technische Hochschule, Zurich (Switzerland).
BOUND AND SCATTERING STATES IN THE HEISENBERG FERROMAGNET Ph.D. Thesis
Jose Fernando Perez 1973 97 p refs
(Rept-5137) Avail: NTIS HC $4.75

Some aspects of the dynamics of the Heisenberg ferromagnet are discussed. It is shown that after imbedding, eta, the Hilbert space of physical states, in the Fock space of lattice bosons, the dynamics can be described by a self adjoint Hamilton operator commuting with the projection onto eta. Some statements of Wortis concerning the existence, the number and the energy of bound states of two magnons are proved and generalized. Asymptotic completeness for the two magnon problem is proven, and the difficulties which arise when trying to prove this, using Faddeev's techniques, for the three magnon problem are discussed. Author

N75-26886# Office of Naval Research, London (England).
INTERNATIONAL CONFERENCE ON THE PHYSICS OF SEMICONDUCTORS, 12TH
S. G. Bishop 7 Nov. 1974 54 p refs Conf. held at Stuttgart, 15-19 Jul. 1974
(AD-A004193; ONRL-C-6-74) Avail: NTIS CSCL 20/12

This report summarizes papers representative of some of the major topics of the Conference. These include electron-hole drops in Ge and Si; photoemission studies of semiconductors; surface studies; structural and electronic densities of states of amorphous tetrahedrally coordinated semiconductors; excitons, phase transitions, superconductivity, and intercalation in layer compounds (two-dimensional solids); magneto-electroreflectance in InSb; ultra-pure Ge; and an outline of the development of semiconductor physics over the past 25 years. GRA

N75-26887# Brown Univ., Providence, R.I. Dept. of Engineering.
HISTORY EFFECTS IN POLYCRYSTALLINE FCC METALS SUBJECTED TO RAPID CHANGES IN STRAIN RATE AND TEMPERATURE Technical Report, Jan. - Sep. 1974
J. Klepaczko, R. A. Frantz, and J. Duffy Dec. 1974 47 p refs
(Contract F33615-73-C-5089; AF Proj. 7353)
(AD-A004460; AFML-TR-74-173) Avail: NTIS CSCL 20/12

A review is presented of available experimental data on strain rate and temperature history effects for fcc polycrystalline metals together with new experimental results on copper and lead. It is evident from all the data presented that history effects play an important role which cannot be neglected in deriving constitutive relations to describe the plastic behavior of metals. It is shown in this paper that the influence of strain or temperature on the flow stress can be divided into two parts. The initial part is due to the existing work-hardened structure at that strain level, while the second is associated with the formation history of that structure. A possible explanation for these effects lies in dynamic recovery processes which take place during the slower deformation before the imposition of the rapid change in strain rate or temperature. GRA

N75-26888*# Colorado Univ., Boulder. Photoconductive Semiconductors and Devices Lab.
ION-IMPLANTED EPITAXIALLY GROWN ZnSe Final Report, 1 May 1974 - 30 Apr. 1975
Fred Chernow 30 Apr. 1975 49 p refs
(Grant NsG-1037)
(NASA-CR-143086) Avail: NTIS HC $3.75 CSCL 20L

The use of ZnSe to obtain efficient, short wavelength injection luminescence was investigated. It was proposed that shorter wavelength emission and higher efficiency be achieved by employing a p-i-n diode structure rather than the normal p-n diode structure. The intervening i layer minimizes concentration quenching effects and the donor-acceptor pair states leading to long wavelength emission. The surface p layer was formed by ion implantation; implantation of the i layer rather than the n substrate permits higher, uncompensated p-type doping. An ion implanted p-n junction in ZnSe is efficiency-limited by high electron injection terminating in nonradiative recombination at the front surface, and by low hole injection resulting from the inability to obtain high conductivity p-type surface layers. While the injection ratio in p-n junctions was determined by the radio of majority carrier concentrations, the injection ratio in p-i-n structures was determined by the mobility ratios and/or space charge neutrality requirements in the i layer. Author

N75-26889*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MOESSBAUER STUDIES IN ZINC-MANGANESE FERRITES FOR USE IN MEASURING SMALL VELOCITIES AND ACCELERATIONS WITH GREAT PRECISION
W. T. Escue, R. G. Gupta (Indian Inst. of Tech., New Delhi), and R. G. Mendiratta (Indian Inst. of Tech., New Delhi) 13 Jun. 1975 35 p refs
(NASA-TM-X-64944) Avail: NTIS HC $3.75 CSCL 20L

Mossbauer spectroscopy was used for a systematic study of the magnetic behavior of manganese and zinc in mixed ferrites. It was observed that Zn2+ has preference to substitute Mn2+ at interstitial sites where the metal ions are tetrahedrally coordinated with four oxygen neighbors. The internal magnetic hyperfine field at the tetrahedral iron site is larger than that at the octahedral site. The relaxation effects were observed to play an important role as the zinc contents were increased, while the spin-correlation time and the magnetic field were observed to decrease in strength. It is concluded that Mossbauer effect data on complex materials, when used in conjunction with other data, can provide useful insight into the origin of the microscopic properties of magnetic materials. Author

N75-26890*# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
ALUMINUM UNDER HIGH PRESSURE. 1: EQUATION OF STATE
Carlos Friedli and N. W. Ashcroft May 1975 23 p refs
(Grant NGR-33-010-189)
(NASA-CR-143081) Avail: NTIS HC $3.25 CSCL 11F

A curve of applied pressure P versus lattice constant a was calculated for single crystal aluminum. It results from an application of the method of structural expansions for deriving the energies of simple metals, a method known to give reasonable results for the elastic constants even at second order in the effective electron-ion interaction. The latter (in the present calculation) is taken from Fermi surface analysis, and it is verified (with essentially experimental information) that the extant face centered cubic structure remains the preferred crystalline phase up to the highest pressures considered. Arguments are given to suggest that the P vs. a curve should have reasonable a priori accuracy, and can be improved if experimental data in the intermediate pressure region are provided to refine the energy dependent pseudo-potential. At 3 megabars the lattice constant was reduced by only 22%; the ion cores at this pressure are still well separated. Author

N75-26891# Eidgenossische Technische Hochschule, Zurich (Switzerland).
CONCERNING THE INFLUENCE OF DIFFUSION ON THE

ELECTRO-CRYSTALLIZATION OF METALS Ph.D. Thesis
Moritz Braun 1973 116 p refs In GERMAN
(Rept-5015) Avail: NTIS HC $5.25

Galvanostatic direct current pulses produced even copper precipitates from sulfuric copper sulfate baths if the diffusion layer was kept thinner than the initial roughness of the electrode. It is shown that the structures of deposited metal layers depend to a great extend on material transport properties.

Transl. by G.G.

N75-26892# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
INVESTIGATION OF TECHNICAL PROBLEMS IN GALLIUM ARSENIDE
Fred H. Eisen, John A. Higgins, Bryant M. Welch, Cheng P. Wen, and Ricardo R. Zucca 30 Jul. 1974 15 p refs
(Contract F19628-74-C-0038; ARPA Order 2489)
(AD-A003704; SC563.10SATR; AFCRL-TR-74-0371; SATR-2) Avail: NTIS

This report presents a bibliography of theses and paper published under this contract. Studies were made on electronic optical properties of amorphous alloys, optical properties, X ray absorption fine structure and magnetooptic Kerr effect of transition and rare earth metal ferromagnets. GRA

N75-26893# Chicago Univ., Ill. Dept. of Chemistry.
ELECTRONIC AND MAGNETIC PROPERTIES OF HIGH TEMPERATURE ELECTROLYTES Final Report, 1 Sep. 1970 - 31 Aug. 1974
Norman H. Nachtrieb 26 Dec. 1974 43 p
(Grant AF-AFOSR-1962-71; AF Proj. 6813)
(AD-A004136; AFOSR-75-0060TR) Avail: NTIS CSCL 07/4

Measurements are reported on the electrical conductance in the Cs-CsCl and Rb-RbCl molten systems as a function of composition and temperature. The solutions are semiconducting at low metal concentration and become metallic with increasing concentration. Excess free energies for solution of metal in salt are evaluated from freezing point data, and are large and positive for the Cs-CsCl and Rb-RbCl systems. Electron spin resonance has been observed in the molten Na-NaCl system. These observations are interpreted in terms of an F-center model of the electron in metal-molten salt solutions. GRA

N75-26894# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
ELECTRON RAMAN EFFECT IN GARNETS, TUNABLE INFRARED LASERS, AND QUANTUM COUNTERS Final Report, 1 Mar. 1971 - 31 Aug. 1974
Richard K. Chang Oct. 1974 62 p refs
(Grant AF-AFOSR-2050-71; AF Proj. 9768)
(AD-A003989; AFOSR-74-1915TR; Rept-9) Avail: NTIS CSCL 20/12

The Raman technique was applied to the study some of the basic properties of rare earth garnets, and preliminary investigations were conducted on a tunable infrared quantum counter and Ho:YIG laser. Using Raman scattering, the following were determined: the phonon energy and symmetry assignments of garnets (YA1G, DyA1G, YbA1G, LuA1G, YGaG, DyGaG, YbGaG, LuGaG, YIG, DyIg, ErIG, and YbIg); the energy of the lower crystal field levels (10-4000/cm) in YbA1G, YbGaG, DyA1G, DyGaG, and ErIG; the dipole and exchange field splittings of several electronic levels for DyA1G below its Neel temperature; and the accuracy of the crystal field parameters by comparing the calculated with the observed Raman intensity. The large anisotropic exchange interaction between the Fe(3+) and Re (3+) ions in Re:YIG can form the basis for tunable IR quantum counters and lasers. Tuning is done by changing the orientation of the Fe (3+) magnetization within the crystalline plane by a 1000 Oe external magnetic field. A tunable quantum counter in the 5 micrometer region is proposed by using Pr:YIG, and laser action was achieved by optically pumping with a Nd:glass laser into the absorption band of the host crystal YIG. GRA

N75-26895# Wisconsin Univ., Madison.
SURFACE STUDIES BY LOW-ENERGY ELECTRON DIFFRACTION AND RELATED TECHNIQUES Final Report
M. B. Webb 27 Dec. 1974 7 p refs
(Grant AF-AFOSR-1966-71; AF Proj. 9761; AF Proj. 6813)
(AD-A003749; AFOSR-75-0030TR) Avail: NTIS CSCL 14/2

The single scattering contribution of the low-energy electron diffraction (LEED) intensity has been extracted by an averaging technique. This allows analysis using only simple modifications of conventional diffraction analysis. Very detailed checks of the procedure have been made for clean surfaces of Ni(111), Ag(111) and W(110). The experimentally averaged intensities agrees with the calculated single scattering intensity to within a few percent. In order to study the effects of lattice dynamics a very accurate diffractometer was built to operate from 8 to 1000K. Thermal diffuse scattering of electrons from Ag were studied and separated into zero, one, and multiphonon scattering events throughout the entire Brillouin zone. This work also makes it possible to account for the thermal scattering sufficiently accurately to study disordered overlayers and surface imperfections on solids. Physisorption of Xe on Ag(111) and chemisorption of O on W were studied. GRA

N75-26896# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
STRUCTURAL PROPERTIES OF AMORPHOUS SEMICONDUCTORS BY MOSSBAUER SPECTROSCOPY Final Report, 20 Apr. 1972 - 30 Jun. 1974
Norman A. Blum and Charles Feldman 31 Dec. 1974 24 p refs
(ARPA Order 1562)
(AD-A003511) Avail: NTIS CSCL 20/12

The Mossbauer effect in tellurium-125 was used to investigate the amorphous to crystalline transition in tellurium thin films. Techniques were developed for producing amorphous tellurium thin films and subsequently crystallizing them during the Mossbauer experiments. During the course of the work several Mossbauer tellurium sources were prepared and studied for narrow line high recoil-free fraction performance. Spectra of amorphous and crystalline tellurium films were compared in which the amorphous phase consistently showed an increased quadrupole splitting and a decreased recoil-free sample. GRA

N75-26897# Florida Univ., Gainesville. Dept. of Electrical Engineering.
INVESTIGATION OF BASIC ELECTRONIC TRANSPORT, RECOMBINATION AND OPTICAL PROPERTIES IN InAs1-XPX ALLOY SYSTEMS AND THE GaSb EPITAXIAL FILMS FOR 1-2 MICROMETER IR APPLICATIONS Semiannual Progress Report, 1 Dec. 1973 - 31 May 1974
Sheng S. Li 15 Jun. 1974 82 p refs
(Contract DAAK02-74-C-0102; ARPA Order 2182; AF Proj. 2182)
(AD-A003981; SAPR-1) Avail: NTIS CSCL 20/12

A systematic study has been made on the effect of hydrogen carrier gas flow-rate on the electron concentration and electron mobility of the epitaxially grown InAs(0.61)P(0.39) samples. Resistivity and Hall effect measurements yield the resistivity, Hall coefficient, electron mobility and electron density as a function of temperature between 3K and 300K for epitaxial samples 153 to 159 and the bulk samples H-2, H-5 and H-6. The activation energy for the donor states, the density of donors and acceptors and scattering mechanisms for electrons in InAs(1-x)P(x) alloys were calculated and analyzed. The alloy compositions were determined from the electron microprobe analysis. The energy band gap versus alloy composition for the InAs(1-x)P(x) system was deduced from the optical transmission data. Optical absorption coefficients near the fundamental absorption edge were obtained for bulk samples H-1, H-2, H-5, H-6, H-7 and W16. The result shows that the energy band gap varies linearly with the alloy composition in InAs(1-x)P(x). GRA

N75-26898# Delaware Univ., Newark. Dept. of Physics.
ELECTRONIC STATES AND VIBRATIONAL MODES OF LEAD AZIDE AND THE EFFECTS THEREON OF PHOTODECOMPOSITION Final Report
Fred Williams 23 Dec. 1974 12 p refs
(Grants DA-ARO(D)-31-124-73-G11;
DA-ARO(D)-31-124-72-G175; DA-ARO(D)-31-124-71-G24;
DA-ARO(D)-31-124-71-G166)
(AD-A004022; ARO-7962.6-A) Avail: NTIS CSCL 07/5

The optical absorption in the ultraviolet and in the near and far infrared of thin films of lead azide have been measured and

interpreted. Low temperature luminescence has been discovered. The effects of photodecomposition on the absorption and luminescence have been determined. The effect of doping with charged impurities has been investigated. The dopants are shown to be substitutional and locally charge compensated by native defects. Photodecomposition is shown to occur where the radiation is absorbed, is not diffusion limited and results in destruction of crystallinity during the early stage of decomposition. The material is therefore amorphous during the later, main stage of decomposition. The relevance of these results to initiation and to detonation is noted. GRA

N75-26899# Princeton Univ., N.J. Dept. of Electrical Engineering.
A STUDY OF THE DIELECTRIC BREAKDOWN OF SiO2 FILMS ON Si BY THE SELF QUENCHING TECHNIQUE
D. Y. Yang, Walter C. Johnson, and Murray A. Lampert Oct. 1974 95 p refs
(Contract F19628-72-C-0298; ARPA Order 2180)
(AD-A004045; SR-4; AFCRL-TR-74-0516) Avail: NTIS CSCL 20/12

The authors have studied the dielectric breakdown of thermally grown SiO2 films on Si substrates by the technique in which a thin metallization is used to provide self-quenching of the breakdown. Each of the four possible combinations of p or n substrate and (+) or (-) field-plate polarity shows its own distinctive properties and its own distinctive configuration of breakdown damage as viewed by optical microscope and scanning electron microscope. Some properties correlate with the nature of the substrate surface channel (inversion versus accumulation); other properties correlate with the field-plate polarity. The time evolution of the breakdown indicates that the current through the fault is limited by the spreading resistance of the substrate. A study of the currents and insulator charging at the onset of breakdown indicates that initiation of breakdown is by Fowler-Nordheim tunneling of electrons into the oxide. The occurrence of a current instability which can be enhanced by lowering the temperature indicates the possible importance of hole-electron pair production in the oxide with subsequent trapping of holes. GRA

N75-26900# Texas A&M Univ., College Station.
KINETIC INDUCTANCE IN THIN FILMS OF AMORPHOUS SUPERCONDUCTORS Final Report, 1 Feb. 1971 - 30 Nov. 1974
D. G. Naugle 1975 10 p
(Grants DA-ARO(D)-31-124-73-G26;
DA-ARO(D)-31-124-71-G81; DA-ARO(D)-31-124-71-G169)
(AD-A004044; ARO-9499-7-P) Avail: NTIS CSCL 20/12

Two major problems were studied experimentally during the course of these grants: (1) the behavior of the kinetic inductance in thin superconducting films, and (2) the influence of an adsorbed noble gas layer on the transition temperature of a superconducting Sn, Tl, Al and Bi thin film. GRA

N75-26901# Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.
ULTRASOFT X-RAY BRAGG AND SPECULAR REFLECTION: THE EFFECTS OF ANOMALOUS DISPERSION Interim Report
Burton L. Henke, Rupert C. Perera, and Ronald H. Ono Aug. 1974 171 p refs
(Grant AF-AFOSR-2174-72; AF Proj. 9751)
(AD-A004157; AFOSR-75-0066TR) Avail: NTIS CSCL 20/2

The objective of this work has been twofold: first, to test a method for quantitatively predicting the atomic scattering factors in the sensitive, anomalous dispersion, low energy X-ray region as based upon semi-classical dispersion theory in which theoretical and experimental partial photoionization cross sections have been used to obtain the required energy dependent oscillator strength densities; and second, to apply these scattering factors, with models for summing atomic, coherent scattering effects for the solid state, to predict the Bragg and specular reflection properties of practical crystal and mirror systems for the ultrasoft X-ray region. GRA

N75-26902# Salford Univ. (England). Dept. of Electrical Engineering.
THE INFLUENCE OF ION IMPLANTATION ON THE SURFACE PROPERTIES OF METALS AND ALLOYS Interim Report, 1 Sep. 1971 - 31 Aug. 1974
G. Carter and W. A. Grant 30 Oct. 1974 20 p refs
(Grant AF-AFOSR-2115-71; AF Proj. 9761)
(AD-A004838; AFOSR-75-0141TR) Avail: NTIS CSCL 20/12

A method for improving the depth resolution in Rutherford scattering measurements is presented. The application of the method is demonstrated by measurements of the range of heavy ions in silicon and aluminum and of the range distriction of Pb in silicon. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N75-26903 Polish Academy of Sciences, Warsaw.
AN OUTLINE OF THE THERMODYNAMICS OF CONTINUOUS MEDIA [ZARYS TERMODYNAMIKI OSRODKOW CIAGLYCH]
Krzysztof Wilmanski 17 Feb. 1975 137 p refs In POLISH
Avail: Issuing Activity

The scope of phenomenological thermodynamics is discussed along with the thermodynamics of continuous media and the thermodynamic theory of materials. Topics discussed include balance equations, Clausius-Duhem inequality, thermoelastic materials, theoretical bases of chemical reaction kinetics in mixtures, heat conduction, thermal diffusion, theory of elasticity, shock waves, thermostatics, Lagrange similarity hypothesis, and sound waves. Transl. by M.J.S.

N75-26904# Eidgenossische Technische Hochschule, Zurich (Switzerland).
ISOTHERMAL CALORIMETRY FOR THERMODYNAMIC AND KINETIC MEASUREMENT Ph.D. Thesis
Hans Weber 1974 118 p refs
(Rept-5098) Avail: NTIS HC $5.25

A theory of calorimetry was developed and used to investigate classical calorimetry and to set a basis for modern isothermal calorimetry. It was shown that a modular concept of such instruments can be an adequate solution to some of the problems in calorimetry. Topics discussed include thermodynamics, linear thermal systems, active thermal systems, analog-computer model of thermal systems, and experimental investigations. M.J.S.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-26905*+ National Aeronautics and Space Administration, Washington, D.C.
MANAGEMENT: A CONTINUING LITERATURE SURVEY WITH INDEXES, MARCH 1975
Mar. 1975 252 p refs
(NASA-SP-7500(09)) Avail: NTIS HC $5.50 CSCL 05A

A special bibliography listing 1,064 reports, articles, and

other documents introduced into the NASA Scientific and Technical Information System in 1974 is presented. Author

N75-26906# Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
AN EVALUATION OF POLICY-RELATED RESEARCH IN FIRE PROTECTION SERVICE MANAGEMENT Final Report
David E. Fyffe and Ronald L. Rardin Oct. 1974 554 p refs (Grant NSF GI-39064)
(PB-240655/1; NSF/RA/S-74-019) Avail: NTIS MF $12.50 CSCL 13L

Evaluations of research in the field of urban fire service management are presented. In conducting the study, some 500 references related to fire service management were located and copies of approximately 350, including 65 which were classed as policy-related fire service management research, were obtained. The research reports were subjected to an evaluation by technical experts and comment by a panel of fire service professionals. Chapters of the report deal with broad, policy-related subject areas with sub-sections devoted to specific issues within the area. GRA

N75-26907# Naval Weapons Engineering Support Activity, Washington, D.C.
NAVY WEAPON SYSTEM LIFE-CYCLE COST MODEL
Gregory A. Opresko Sep. 1974 133 p refs
(AD-A003905; NAVWESA-R-746) Avail: NTIS CSCL 15/5

The Navy Weapon System Life-Cycle Cost Model is a generalized user-oriented cost model that calculates and displays system costs in accordance with a Work Breakdown Structure (WBS) or similar hierarchal cost level scheme. It is applicable to any development program in which costs must be monitored and recalculated for frequent changes in cost-related parameters. The model is intended for use by a cost analyst. GRA

N75-26908# Naval Postgraduate School, Monterey, Calif.
HUMAN FACTORS ENGINEERING IN NAVY SYSTEMS ACQUISITION M.S. Thesis
Glenn Alton Casey and William Philip Sturm Dec. 1974 170 p refs
(AD-A003782) Avail: NTIS CSCL 15/5

The fact that human factors analysis has become one of the principal elements of systems engineering underscores its importance in systems acquisition management today. Therefore, instead of justifying the use of human factors in systems design, the authors concentrated on presenting a method of human factors application that can be more gainfully employed in the acquisition of naval programs. Additionally, the authors in their analysis discuss the depth of application of human factors engineering and when and where it should be applied in the development of a system. GRA

N75-26909# Naval Postgraduate School, Monterey, Calif.
THE DEVELOPMENT OF AN INTERFUNCTIONAL NETWORK FOR THE IMPLEMENTATION OF THE DEPARTMENT OF DEFENSE LOGPLAN M.S. Thesis
Dean Edward Dilger and Terry Alan Fulton Dec. 1974 81 p refs
(AD-A003786) Avail: NTIS CSCL 15/5

The Department of Defense Logistics Systems Plan (LOGPLAN) is a document that constitutes the Department of Defense-wide, long-range plan for logistics systems improvement during the 1975-1980 time frame. The LOGPLAN contains a number of implementing actions for these logistics systems improvements which must be initiated during this time period. The purpose of this paper is to develop and evaluate a model which determines relationships among the one hundred fourteen implementing actions and arranges them into a logical progression for systematic implementation. This paper discusses LOGPLAN in general, the model developed, and an evaluation of the model. GRA

N75-26910# Texas A&M Univ., College Station. Inst. of Statistics.
STATISTICAL CRITICAL PATH ANALYSIS IN ACYCLIC STOCHASTIC NETWORKS (STATISTICAL PERT)
R. L. Sielken, Jr., L. J. Ringer, H. O. Hartley, and E. Arseven Nov. 1974 144 p refs
(Contract N00014-68-A-0140; NR Proj. 047-700)
(AD-A003550; Themis-TR-48) Avail: NTIS CSCL 05/1

This paper describes and illustrates a comprehensive new procedure for obtaining information about the distribution of a project's completion time when the project is comprised of a large number of activities and the time required to complete an individual activity once it can be begun is a random variable. The project is represented as an acyclic network whose arcs correspond to the project activities. This network is simplified by replacing various activity configurations by single equivalent activities and then decomposed into several subnetworks. The distribution and moments of each subnetwork's completion time are bounded and approximated on the basis of two percentiles from each activity's completion time distribution by using some mathematical programming techniques and a new result in the theory of networks. The project's completion time distribution is then approximated by combining the approximate subnetwork distributions. The computer programs required to implement the general procedure are listed and documented. GRA

N75-26911# Naval Postgraduate School, Monterey, Calif.
ESCALATION PROVISIONS IN DOD PROCUREMENT: A REVIEW OF THE PROBLEM AND A FRAMEWORK FOR ANALYSIS M.S. Thesis
Robert William Eberth Dec. 1974 41 p refs
(AD-A003541) Avail: NTIS CSCL 15/5

The study reviewed the opinions and concerns expressed by various government and private industry sources with regard to the use and structure of escalation (i.e., economic price adjustment) provisions in government procurement contracting. A framework was designed to facilitate the analysis of the relationship of escalation provisions and price level uncertainty. The specific model employed examined interacting objectives of the government and a firm in a sole-source contract negotiation scenario. A method was developed to approximate the increase in contract price required by the firm as compensation for accepting the risk of uncertain price levels. A criterion was established for the employment of the escalation provision in the modeled scenario. GRA

N75-26912# Naval Postgraduate School, Monterey, Calif.
A CASE STUDY OF REPAIR/DISCARD IMPLICATIONS IN ILS M.S. Thesis
Edward Bryant Dorsey and Malvern Maynard Mizner Sep. 1974 91 p refs
(AD-A003791) Avail: NTIS CSCL 15/5

Integrated Logistic Support (ILS) is a relatively new concept involving many interrelated operations that are critical to the effectiveness of the final product. The thesis is designed to introduce students to the difficulties of implementing ILS in Navy acquisition projects. A case study is developed around the repair/discard decision that impacts heavily on life cycle costs. Background information is provided for students with limited experience in ILS. GRA

N75-26913# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.
A MATHEMATICAL THEORY OF ORGANIZATION. PART 1. CENTRALIZED ORGANIZATION Final Technical Report, Apr. 1972 - Sep. 1974
R. F. Drenick and A. H. Levis Oct. 1974 121 p refs Prepared in cooperation with Systems Control, Inc., Palo Alto, Calif.
(Contract N00014-67-A-0438-0012; NR Proj. 278-050)
(AD-A003601) Avail: NTIS CSCL 05/1

Results are reported of the first phase of a mathematical theory which is intended to explain, and aid in the review of, organizations of men and machines in general and of command and control systems in particular. Starting from relatively broad assumptions regarding the abilities and limitations of organization members, the theory develops a method by which the optimal structure and doctrine of the organization can in principle be synthesized. The results of the synthesis are in good agreement with experience in practice. GRA

N75-26914# Air Force Human Resources Lab., Brooks AFB, Tex.
MODIFIED TOPCAP OBJECTIVE FORCE STRUCTURE MODEL Final Report

James A. Hoskins Aug. 1974 16 p refs
(AF Proj. 2077)
(AD-A004760; AFHRL-TR-74-64) Avail: NTIS CSCL 05/9

Spiralling personnel costs, coupled with increased emphasis on management by objectives, has accentuated evaluation of personnel quality/quantity/cost tradeoffs pertinent to the development of a career force objective and enlisted force management system. A modification to one of the methodologies in the Total Objective Plan for Career Airman Personnel (TOPCAP) Computerized Management System, the Objective Force Structure Model, is proposed. The effort was prompted by a need for a method to evaluate tradeoffs between the quality of personnel entering the career force and the effects on the TOPCAP objective grade and force configuration. GRA

N75-26915# National Bureau of Standards, Washington, D.C. Center for Fire Research.
A SURVEY FOR THE COLLECTION OF PROFESSIONAL OPINION ON SELECTED FIRE PROTECTION ENGINEERING TOPICS
Gregory A. Harrison and James L. Houser Mar. 1975 32 p
(COM-75-10287/1; NBS-TN-861; LC-75-600001) Avail: NTIS; SOD HC as C13.46:821 CSCL 13L

A survey questionnaire on selected fire protection engineering topics was sent to 422 persons from every state and major city in the United States and, parts of Canada. Those surveyed included architects, engineers, insurance and government representatives, academicians, and fire services personnel. One hundred and eighty six questionnaires were returned, a return rate is more than double the national average on survey returns. The questionnaire covered topics such as, the adequacy of the term noncombustible as contained in the National Fire Protection Association's National Fire Code, hazards of fire loading concepts, code regulations and enforcement. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-26916 Minnesota Univ., Minneapolis.
ON THE SELECTION AND GENERATION OF PROCESS GROUPINGS AND FILE CONSOLIDATIONS FOR INFORMATION PROCESSING SYSTEM DESIGN Ph.D. Thesis
Hugh Frederick Juergens 1974 400 p
Avail: Univ. Microfilms Order No. 75-12090

An information processing system is described as consisting of two interdependent subsystems: the processing subsystem and the file subsystem. The interactions of these subsystems are considered in terms of a graph theoretic representation of information flows. Design decisions are formulated in response to a given set of information flows within an organization: the determination of the operations to be performed by each computer program (process grouping) and the data to be contained in each file (file consolidation). Through process grouping and file consolidation, a system description is generated by combining and structuring the processes and files into a logically consistent and efficient system. As a product of the design, models are presented so that the system designer can determine the computations that comprise each process, identify the data requirements of each process, determine the data to be contained in each file, identify the mapping between the data requirements of the processes and the contents of the files, and identify the redundant data that is stored and transported in the system. The concept of file transport volume is used to evaluate the various design alternatives. Dissert. Abstr.

N75-26917*# Alabama Univ., Huntsville. Center for Environmental and Energy Studies.
FEASIBILITY OF USING THE MIRADS DATA MANAGEMENT SYSTEM FOR A STATE AIR POLLUTION AGENCY
Bernard J. Schroer 25 Jun. 1975 71 p refs
(Contract NAS8-30885)
(NASA-CR-143878; UAH-RR-171) Avail: NTIS HC $4.25 CSCL 05B

The MIRADS is a generalized data management system. The feasibility of using MIRADS by the State of Alabama Air Pollution Control Commission is explored. The State's enforcement management system and the emission inventory system were implemented into MIRADS. Author

N75-26918# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE THEORY AND PRACTICE OF FORECASTING THE DEVELOPMENT FOR SCIENCE AND TECHNOLOGY IN THE MEMBER COUNTRIES OF COMECON
D. Zhimerin 15 Nov. 1974 36 p Transl. into ENGLISH of the book "Soviet ekonomicheskoi vzaimopomoshchi. Postoyannaya komissiya po koordinatsii Nauchnykh i tekhnicheskikh issledosanii. Teoriya i praktika prognozirovaniya razvitiya nauki i tekhniki v stranakhchlenakh sev" USSR, 1971 p 1-22
(AD-A003816; FTD-HC-23-2330-74) Avail: NTIS CSCL 05/1

The report is a summary of a symposium attended by member countries of COMECON, composed of socialist countries grouped together for economic mutual assistance. The papers discuss the importance of scientific and technological forecasting as a principal method of advancing development. The development of the U.S.S.R. electrical power system is discussed in detail. GRA

N75-26919# Naval Postgraduate School, Monterey, Calif.
TECHNOLOGY TRANSFER AND UTILIZATION METHODOLOGY FURTHER ANALYSIS OF THE LINKER CONCEPT
J. A. Jolly and W. J. Creighton 30 Jun. 1974 53 p refs
(AD-A003867; NPS-55JO74061) Avail: NTIS CSCL 05/2

The concept that a model of the methodology of technology transfer and utilization has two major subdivisions, formal vs informal communications, is discussed briefly. Some literature support for the informal communications aspect of the model of the methodology of technology transfer and utilization are presented. An in depth analysis is made of one of the informal elements of the model, linker-stabilizer behavior. The analysis is based on two studies of technically trained personnel: one, Naval Officers, and the Second, Government Service Employees. The thrust of the analysis and the conclusion seem to indicate strongly that the commonality of the technical training is more dominant than the decision to be a Naval Officer or a Government Service Employee. This conclusion thus supports the belief that the distribution of linker-stabilizer behavior characteristics has a general base in terms of technically trained personnel and is not unique to a select population. GRA

N75-26920# Army Materiel Command, Alexandria, Va.
POINTS OF CONTACT, SCIENTIFIC AND TECHNICAL INFORMATION
Jan. 1975 32 p refs
(AD-A003820) Avail: NTIS CSCL 05/2

Organization points of contact are identified that are initial points of contact for research and development information within U.S. Government Agencies. Emphasis is placed on the Department of Army. A subject/title index and a glossary of acronyms is included. GRA

N75-26921# Purdue Univ., Lafayette, Ind. Center for Information and Numerical Data Analysis and Synthesis.
THERMOPHYSICAL AND ELECTRONIC PROPERTIES INFORMATION ANALYSIS CENTER (TEPIAC): A CONTINUING SYSTEMATIC PROGRAM ON TABLES OF THERMOPHYSICAL AND ELECTRONIC PROPERTIES OF MATERIALS Final Report, 8 Oct. 1973 - 7 Oct. 1974
Cho-Yen Ho Nov. 1974 97 p ref
(Contract DSA900-74-C-2428)
(AD-A003489; AMMRC-CTR-74-67) Avail: NTIS CSCL 05/2

This Final Report describes the activities and accomplishments of the Thermophysical and Electronic Properties Information Analysis Center (TEPIAC) in the period 8 October 1973 to 7 October 1974. TEPIAC's activities reported include literature search, acquisition, and input of source information; document codification and substance classification; operation of a computerized information storage and retrieval system; preparation

and publication of the Thermophysical Properties Research Literature Retrieval Guide Supplement; data extraction and compilation; data evaluation, correlation, analysis, synthesis, and generation of recommended reference values; preparation and publication of the Thermophysical Properties of Matter - The TPRC Data Series, reports on electronic properties, state-of-the-art summaries, and critical reviews; technical and bibliographic inquiry services; and current awareness and promotion efforts. TEPIAC covers 14 thermophysical properties of all matter at all temperatures and 22 electronic (including also electrical, magnetic, and optical) properties and property groups of selected material groups at all temperatures. GRA

N75-26922# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF THE EFFECTIVENESS OF A RESEARCH ORGANIZATION'S MECHANISM FOR TRANSFERRING TECHNICAL INFORMATION TO APPLIED END USE M.S. Thesis
Jack Ellis Hendrickson and William Grayson Fisher, Jr. Dec. 1974 94 p refs
(AD-A003501; NPS-55J074121) Avail: NTIS CSCL 05/2

An organizational mechanism instituted at a research/development center to facilitate the transfer of technological information to field operating units is analyzed in an attempt to measure its effectiveness. The evaluation is based on a model derived to quantify the benefits of the information transferred to end users. In addition, other organizational parameters of the users and suppliers of information is evaluated to determine an optimal configuration to maximize the effectiveness of the transfer mechanism. GRA

N75-26923# Naval Postgraduate School, Monterey, Calif.
INFORMATION REQUIREMENTS OF A MANAGEMENT INFORMATION SYSTEM RELATING TO THE BUDGETARY DECISIONS OF A COAST GUARD PROGRAM MANAGER M.S. Thesis
James Dale Burk and John Kennedy Miner Dec. 1974 100 p refs
(AD-A003858) Avail: NTIS CSCL 05/1

Information is the lifeblood of any organization. In an era where governmental budgeting is becoming more complex and more significant, operations without the aid of an effective management information system is difficult at best. Prior to the implementation of any management information system, a sound all-encompassing data base is essential. This thesis proposes information requirements to such a data base to be utilized by Coast Guard district level program managers when making budgetary decisions. GRA

N75-26924# Sanders and Thomas, Inc., Pottstown, Pa.
QUALITATIVE REQUIREMENTS INFORMATION ARMY POTENTIAL DEFENSE CONTRACTORS PROGRAM PROCEDURES FOR REGISTRATION Final Report, 1973 - 1974
James G. Peirce, Herman B. Spiegel, and Norman B. Reed Dec. 1974 57 p refs
(Contract DAAA25-74-C-0697; DA Proj. 1P7-65801-MM-01) (AD-A004032; FA-TR-74042) Avail: NTIS CSCL 15/5

This final report describes the Army operations which implement the overall DOD potential defense contractors program, which has been coordinated with the Air Force and the Navy. The Army has eliminated use of the DD Form 1630 for the PDC program, although it will remain viable in connection with bidders mailing lists. The replacement of the automated QRI RODATA information system by a less expensive system is also described. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-26925# Commerce Dept., Washington, D.C.
[SOCIAL AND ECONOMIC STUDIES, BUSINESS VENTURES, AND OCEAN AND ATMOSPHERIC RESEARCH] Annual Report, period ending 30 Jun. 1974
2 Dec. 1974 94 p refs
(COM-75-50064/5) Avail: NTIS MF $2.25; SOD HC CSCL 05C

Contents: The department overall; General administration; Social and economic statistics; Economic development; Regional action planning commission program; Domestic and international business; Tourism; Foreign direct investment; Minority business enterprise; Science and technology; Oceanic and atmospheric activities; Maritime affairs. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N75-26926# Committee on Science and Technology (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1976
Washington GPO 19 Jun. 1975 6 p H.R. 4700 enacted into law by the 94th Congr., 19 Jun. 1975
(Pub-Law-94-39; GPO-38-139) Avail: US Capitol, House Document Room

Areas of space research, program management, and facility construction are itemized and the associated federal appropriations are assigned for 1976. Restrictions, limitations, and information on the transfer, use, and geographical distribution of funds are given. Plans for the development of a research program on the upper atmosphere are discussed. L.B.

N75-26927# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1976, VOLUME 2, PART 1
Washington GPO 1975 892 p refs Hearings on H.R. 2931 (superseded by H.R. 4700) before Subcomm. on Space Sci. and Applications of Comm. on Sci. and Technol., 94th Congr., 1st Sess., 5, 17 Feb. 1975
(GPO-49-386) Avail: Subcomm. on Space Sci. and Applications

A comproehensive coverage of the practical applications of satellite programs and related aerospace activities and the socioeconomic benefits to earth of such programs (cost estimates included) is presented. Topics considered are: (1) oceanography; (2) agriculture; (3) climatology; (4) geography; (5) communications; (6) environmental monitoring; and (7) materials science. J.R.T.

N75-26928# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1976, VOLUME 1
Washington GPO 1975 236 p refs Hearing on H.R. 2931 (superseded by H.R. 4700) before Comm. on Sci. and Technol., 94th Congr., 1st Sess., 4 Feb. 1975
(GPO-49-078) Avail: Comm. on Sci. and Technol.

A Bill is presented by the House of Representatives to authorize appropriations to NASA for research and development and the construction of facilities. The space shuttle, planetary exploration, research and technology, and space and nuclear research are discussed. M.C.F.

N75-26929# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1976, VOLUME 2, PART 2
Washington GPO 1975 657 p refs Hearings on H.R. 2931 (superseded by H.R. 4700) before Subcomm. on Space Sci. and Applications of Comm. on Sci. and Technol., 94th Congr., 1st Sess., 18 Feb. 1975
(GPO-49-295) Avail: Subcomm. on Space Sci. and Applications

The space science section of the NASA budget is discussed. Areas discussed include the physics and astronomy program, the planetary exploration program, the lunar program, and the launch vehicle and propulsion program. M.J.S.

N75-26930# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1976, VOLUME 2, PART 3
Washington GPO 1975 1307 p refs Hearings on H.R. 2931 (superseded by H.R. 4700) before Subcomm. on Space Sci. and Applications of Comm. on Sci. and Technol., 94th Congr., 1st Sess., 19-20 Feb. 1975
(GPO-49-296) Avail: Subcomm. on Space Sci. and Applications

A comprehensive evaluation of the major NASA Space Programs, with cost analyses, and space technology applications for earth, is presented. Topics covered are: (1) the Space Shuttle; (2) European Space Programs (the Spacelab); (3) the Apollo Soyuz Project; and (4) the Large Space Telescope. Spacecraft configurations are illustrated, and medical and other scientific information from previous space missions is discussed. J.R.T.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-26931*# Stanford Research Inst., Menlo Park, Calif.
TECHNOLOGY TRANSFER-TRANSPORTATION Annual Report, 15 Aug. 1973 - 15 Aug. 1974
Tom Anyos, Ruth Lizak, James Wilhelm, and Kenneth Hirschberg Sep. 1974 39 p
(Contract NASw-2455)
(NASA-CR-143040) Avail: NTIS HC $3.75 CSCL 13F

The application of aerospace technology to the solution of urban public transportation problems is considered. Data are given on highway and railway systems with particular attention given to safety devices, fuel economy, and measures for profiling railways and highways. The development of streamlined truck bodies, to reduce air drag, and efficient brake systems for light trucks and other vehicles was also dealt with. E.H.W.

N75-26932# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
EMISSION CHARACTERISTICS OF A PRIME MOVER FOR HYBRID VEHICLE USE
J. R. Allsup and R. D. Fleming Dec. 1974 38 p refs
(PB-240146/1; IBM-RI-7988) Avail: NTIS HC $3.75 CSCL 13B

A conventional spark-ignition engine was studied as a prime mover for use in a hybrid system. The study involved both steady-state and transient engine operation with ignition timing, air-fuel ratio, exhaust gas recirculation, oxidizing type catalytic converters, engine speed, and power output as variables. Data were obtained from two 1971 model 350 cubic-inch-displacement engines mounted on engine dynamometer stands. When the hybrid engine was operated with an oxidizing catalyst at power output levels required for a 4,000-lb curb weight hybrid vehicle, carbon monoxide and hydrocarbon emissions could be reduced to 1.5 to 2.5 grams per brake horsepower hour and 0.2 to 0.4 grams per brake horsepower hour, respectively. GRA

N75-26933# Hammitt (Andrew G.) Associates, Rancho Palos Verdes, Calif.
AERODYNAMICS OF HIGH SPEED GROUND TRANSPORTATION. RESEARCH AND DEVELOPMENT PLAN Final Report
Andrew G. Hammitt Jun. 1974 83 p refs
(Contract DOT-FR-4-4068)
(PB-239865/9; FRA-ORD/D-75-17) Avail: NTIS HC $4.75 CSCL 13B

The aerodynamic problems of high speed ground transportation systems were examined for both conventional rail and other high speed systems. An aerodynamic research and development program was developed to provide the required information. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-26934 California Inst. of Tech., Pasadena.
THE STRUCTURE AND STABILITY OF RELATIVISTIC, DIFFERENTIALLY ROTATING STARS Ph.D. Thesis
Fredrick Hampton Seguin 1975 105 p
Avail: Univ. Microfilms Order No. 75-12518

The stability of axisymmetric, differential rotation in nonmagnetic stars of uniform chemical composition was studied in the context of general relativity theory. Criteria are found for stability against local, linear, axisymmetric perturbations in conducting, viscous stars and in perfect fluid models. When stated in the proper language, the relativistic stability conditions have the same forms as the nonrelativistic conditions. Applications of the stability conditions to models of specific astrophysical objects are discussed. The equations of hydrodynamics in the post-Newtonian approximation to general relativity are applied to differentially rotating, barytropic stars. It is shown that the equation of hydrodynamic equilibrium can be integrated to yield a simple algebraic equation, and the gravitational field equations can be written in easily handled integral forms. These facts make possible an iterative scheme of the 'self-consistent field method' type which can be used to construct numerical models.
Dissert. Abstr.

N75-26935 Florida State Univ., Tallahassee.
LOW FREQUENCY SPECTRA OF COMPACT RADIO SOURCES Ph.D. Thesis
George Michael Resch 1974 214 p
Avail: Univ. Microfilms Order No. 75-12668

Low-frequency very-long-baseline observations were made to measure the intrinsic size of compact radio sources and to compare the directly observed sizes with those sizes inferred from scintillation techniques. The results of a series of very-long-baseline interferrometric experiments are presented. The calibration of the experiment is discussed and it is shown that the internal consistency as well as the agreement with an independent flux density scale is excellent. The data are compared with flux density and source size determinations from interplanetary scintillation observations and it is argued that the size scale of the scintillation determinations is too large by some small but non-trivial factor. The spectra is presented and the structure of a few selected radio sources is summarized. Dissert. Abstr.

N75-26936 California Univ., Santa Cruz.
A STUDY OF THE MOTION, MEMBERSHIP, AND DISTANCE OF THE HYADES CLUSTER Ph.D. Thesis
Robert Bruce Hanson 1974 66 p
Avail: Univ. Microfilms Order No. 75-12017

Absolute proper motions referred directly to external galaxies, photographic photometry, and cluster membership probabilities were determined for over 600 faint stars in the Hyades region. These were used to investigate the Hyades convergent point and distance. A detailed review of the foundations of the convergent point method, its applicability to the Hyades, the several mathematical variations of the method, and its possible role in producing the apparent discrepancy between previous Hyades proper motion results and secondary Hyades distance indicators, was carried out. The convergent point method, as applied to the Hyades, is entirely valid, and cannot be the source

of any significant error in the Hyades distance. Systematic errors in meridian circle proper motions are implicated as the cause of the observed Hyades distance discrepancy. Dissert. Abstr.

N75-26937*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE 1973 SOLAR OCCULTATION OF THE CRAB NEBULA PULSAR
Joel M. Weisberg May 1975 72 p refs
(Grant NGL-16-001-002)
(NASA-CR-142984; U-of-Iowa-75-15) Avail: NTIS HC $4.25 CSCL 03A

The mean electron density of the solar corona was determined by measuring the dispersion of radiofrequency pulses from pulsar NP 0532 during the June 1973 solar occultation. Trends continued which were noticed in 1971 as solar activity declined. Model fitting results suggest that the corona continued to become even more concentrated toward the equator in 1973 than in 1971. The number density of electrons in most regions decreased. The best model of the distribution of corona electrons is suggested to be one with zero density at the poles. K-corona isophotes and contours of equal path-integrated density are presented for several models. Electron density versus date and position in the corona are tabulated. It is seen that there is no simple relationship between the onset of major solar activity and density or scattering enhancements. Author

N75-26938*# Systems Research Lab., Champaign, Ill.
RESEARCH STUDY ON STABILIZATION AND CONTROL MODERN SAMPLED-DATE CONTROL THEORY. STABILITY ANALYSIS OF THE LOW COST LARGE SPACE TELESCOPE SYSTEM Bimonthly Report
B. C. Kuo and G. Singh 1 May 1975 55 p refs
(Contract NAS8-29853)
(NASA-CR-143871) Avail: NTIS HC $4.25 CSCL 03A

A mathematical model employing Fourier series is used to show quantization and reaction wheel friction nonlinearity in a telescope system for use in space. Block diagrams are used to illustrate the system. A discrete describing function of a quantizer also is given, and input and output signal waveforms, with illustrative examples, are shown. J.R.T.

N75-26939*# Hale Observatories, Pasadena, Calif.
THE SPECTRAL ENERGY DISTRIBUTION OF NGC 1275
G. A. Shields (Tex. Univ., Austin) and J. B. Oke 1975 19 p refs
(Grant NGL-05-002-134)
(NASA-CR-143039) Avail: NTIS HC $3.25 CSCL 03A

An analysis of absolute spectral energy distributions of interstellar gas for a galaxy (NGC 1275) is presented. Infrared spectra data shows heavy reddening. It is proposed that the interstellar gas may be ionized by shock waves or by nonthermal or stellar radiation. It is suggested, that high velocity, emission-line knots are H2 regions in a Perseus cluster galaxy or intergalactic gas cloud seen in projection against NGC 1275. Author

N75-26940*# Texas Univ., Austin. Dept. of Astronomy.
THE THEORY OF ENCELADUS AND DIONE: AN APPLICATION OF COMPUTERIZED ALGEBRA IN DYNAMICAL ASTRONOMY
William H. Jefferys and Lynne M. Ries [1974] 12 p refs
(Grant NGR-44-012-282)
(NASA-CR-142980) Avail: NTIS HC $3.25 CSCL 03A

A theory of Saturn's satellites Enceladus and Dione is discussed which is literal (all constants of integration appear explicitly), canonically invariant (the Hori-Lie method is used), and which correctly handles the eccentricity-type resonance between the two satellites. Algebraic manipulations are designed to be performed using the TRIGMAN formula manipulation language, and computer programs were developed so that, with minor modifications, they can be used on the Mimas-Tethys and Titan-Hyperion systems. Author

N75-26941*# Columbia Univ., New York. Astrophysics Lab.
X-RAY ASTRONOMY Status Report, 1 Jan. - 31 Dec. 1974
R. Novick Jul. 1975 33 p refs
(Grant NGR-33-008-102)
(NASA-CR-142981; CAL-1267) Avail: NTIS HC $3.75 CSCL 03A

Various experiments in X-ray astronomy are described. The occurrence of lunar occultations of the Crab Nebula were utilized to determine the spatial distribution of X-ray emitting regions in the nebula. Study of the Cygnus Loop included a search for a central X-ray point source for the area and measurement of the energy spectrum of the flux from the supernova remnant. The X-ray morphology of the Perseus cluster of galaxies was studied. X-ray spectra of different points in the cluster were also obtained. In addition, the construction of a high resolution gas fluorescence proportional counter for application to X-ray astronomy is discussed. D.M.L.

N75-26942*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PULSAR AVERAGE WAVEFORMS AND HOLLOW CONE BEAM MODELS
D. C. Backer Jun. 1975 44 p refs Submitted for publication
(NASA-TM-X-70917; X-693-75-138) Avail: NTIS HC $3.75 CSCL 03A

An analysis of pulsar average waveforms at radio frequencies from 40 MHz to 15 GHz is presented. The analysis is based on the hypothesis that the observer sees one cut of a hollow-cone beam pattern and that stationary properties of the emission vary over the cone. The distributions of apparent cone widths for different observed forms of the average pulse profiles (single, double/unresolved, double/resolved, triple and multiple) are in modest agreement with a model of a circular hollow-cone beam with random observer-spin axis orientation, a random cone axis-spin axis alignment, and a small range of physical hollow-cone parameters for all objects. Author

N75-26943# Chalmers Univ. of Technology, Goteborg (Sweden). Onsala Space Obs.
RADIO OBSERVATIONS OF INTERSTELLAR CH, PART 2
Ae. Hjalmarson, A. Sume, J. Ellder, O. E. H. Rydbeck, E. Moore (Mass. Univ., Amherst), R. Huguenin (Mass. Univ., Amherst), Aa. Sandqvist (Stockholm Obs.), P. O. Lindblad (Stockholm Obs.), and P. Lindroos (Stockholm Obs.) 1975 98 p refs
(RR-124) Avail: NTIS HC $4.75

A telescope, equipped with a travelling wave maser preamplifier, was used to study emission in the three hyperfine transitions of the doublet state of interstellar CH. The main line was detected towards more than one hundred positions in optically dark nebulae. All three lines were observed in many directions with relatively strong main line emission. One of the main purposes of the observation was to study the excitation of interstellar CH in dark dust clouds. A statistical analysis of the data indicates that the antenna temperature increases linearly with the cloud opacity class, or the cloud density. An increase is also found for the CH column density, but it seems that the ratio between the CH and the total hydrogen column densities decreases for more opaque clouds. Available optical data agree well with the radio results. For Volume 1, see N75-25785. Author

N75-26944# Ruhr Univ., Bochum (West Germany). Inst. fuer Astronomie.
PHOTOGRAPHIC UBV MAGNITUDES IN 14 YOUNG STAR CLUSTERS OF THE NORTHERN MILKY WAY [PHOTOGRAPHISCHE UBV-HELLIGKEITEN IN 14 JUNGEN STERNHAUFEN DER NOERDLICHEN MILCHSTRASSE]
A. F. J. Moffat and N. Vogt 1974 170 p refs In GERMAN; ENGLISH summary Sponsored in part by Deut. Forschungsgemeinschaft and Imperial Oil Co., Can.
(RUB-AI-2) Avail: NTIS HC $6.25

The identification charts and UBV-brightness of about 22000 stars up to a limit of V is approximately 17 m from 14 young star clusters and adjacent fields of the northern Milky Way are discussed. In most cases, the adjacent fields are located symmetrically around each cluster and allow a statistical subtraction from the corresponding cluster region to yield net two-color and color magnitude diagrams. The methods used for reducing iris photometer readings are described. The semiempirical method of Moffat for deriving the calibration curve is completed by considering the scattering effects in the Schmidt system and in the photographic plate for bright stars. The effect of inhomogeneous background blackening by interstellar H2 emis-

sion or by scattered light from bright near stars is eliminated by an empirical method. ESRO

N75-26945# Panametrics, Inc., Waltham, Mass.
A SATELLITE TELESCOPE FOR PROTONS AND ALPHAS Final Report, 17 Nov. 1972 - 30 Nov. 1974
Paul R. Morel, Frederick A. Hanser, and Bach Sellers Nov. 1974 39 p refs
(Contract F19628-73-C-0213; AF Proj. 8600)
(AD-A003727; AFCRL-TR-74-0531) Avail: NTIS CSCL 18/4

A satellite-borne detector for protons and alpha particles has been developed and flown. The detector uses two totally depleted silicon surface barrier detectors in a coincidence telescope arrangement to detect 5-100 MeV protons and 22-100 MeV alpha particles. A calibration mode allows the front detector to be used to detect launched on board satellite OV5-6 in May 1969 and is still yielding reliable data more than 5 years later. GRA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-26946 New York Univ., N.Y. School of Engineering and Science.
SOME ASPECTS OF THE ENERGETICS OF TRAVELLING PLANETARY-SCALE WAVES Ph.D. Thesis
Richard Paul McNulty 1974 270 p
Avail: Univ. Microfilms Order No. 75-12467

The energetics of travelling planetary-scale waves are examined in terms of the vertical flux of geopotential and the energy conversion from zonal potential energy to wave energy. Results are calculated spectrally for a 23-month period and seasonally averaged. Theoretical treatment of the vertical propagation problem is reviewed. Upward flux is maximum during the winter and minimum during the summer. The second zonal harmonic is dominant in the troposphere, emphasizing the influence of topography on vertically propagating energy. Vertical flux convergence is maximum around jet stream level. Travelling wave vertical flux is small except during the summer, when it becomes the principal energy link between the troposphere and stratosphere. Energy conversion results show a three-layer pattern during the cooler part of the year which consists of positive baroclinic energy conversions in the middle stratosphere and troposphere, with the refrigerator effect present in the lower stratosphere. Dissert. Abstr.

N75-26947 New Mexico State Univ., Las Cruces.
RADIO OBSERVATIONS OF H 2 REGIONS IN THE GALACTIC CENTER Ph.D. Thesis
Thomas Albert Pauls 1974 93 p
Avail: Univ. Microfilms Order No. 75-10825

Observations of radio recombination lines allow sources which lue along the line of sight to be distinguished from those in the galactic center. The separation is based on the radial velocities and widths of the lines. The galactic center lines arise in discrete sources and an extended thermal source. The discrete H regions are all at positive longitudes. The extended source appears to rotate as a rigid body and is neither expanding nor contracting. The extended source differs in this respect from the clouds of H2CO and OH, which appear to form rotating and expanding rings. Within 15 arc min of Sgr A the kinematics of the ionized gas changes. Most of the lines from this region have negative velocities, but little systematic behavior is apparent. High resolution observations of CO show no correlation with the recombination lines. Dissert. Abstr.

N75-26948 Iowa Univ., Iowa City.
ENERGETIC PARTICLE FLUXES AND SPECTRA IN THE JOVIAN MAGNETOSPHERE Ph.D. Thesis
Daniel Neal Baker 1974 219 p
Avail: Univ. Microfilms Order No. 75-13722

The Pioneer 10 particle detector is described and summaries of detector calibrations, data analysis techniques, and pertinent tyeories of the Jovian magnetosphere are presented. The in situ observations made with the energetic particle detector in the Jovian magnetosphere reveal a relatively thin, outer magnetospheric region (called the magnetodisc) extending to a radial distance of over 100 R sub J (Jovian radii) and a central magnetosphere of stably trapped particles inside of 15 to 20 R sub J. Particle species identification analysis demonstrates that observed counting rates are due primarily to electrons. Dissert. Abstr.

N75-26949*# Alabama Univ., Huntsville.
RELATIVISTIC ASTROPHYSICS Final Report, 1974 - 1975
Larry L. Smalley 1975 51 p refs
(Grant NGL-01-008-001)
(NASA-CR-142988; FR-4) Avail: NTIS HC $4.25 CSCL 03B

The coordinate independence of gravitational radiation and the parameterized post-Newtonian approximation from which it is extended are described. The general consistency of the field equations with Bianchi identities, gauge conditions, and the Newtonian limit of the perfect fluid equations of hydrodynamics are studied. A technique of modification is indicated for application to vector-metric or double metric theories, as well as to scalar-tensor theories. L.B.

N75-26950*# South Carolina Univ., Columbia.
INFRARED SPECTRA OF MOLECULES AND MATERIALS OF ASTROPHYSICAL INTEREST Quarterly Progress Report, 15 Mar. - 15 Jun. 1975
James R. Durig Jul. 1975 55 p
(Grant NGL-41-002-003)
(NASA-CR-143025; Rept-32) Avail: NTIS HC $4.25 CSCL 03B

The vibrational spectra from 4000 to 33 cm-1 of several modecules which may be present in the atmosphere of the Jovian planets are studied to provide vibrational frequencies which can be used to: (1) determine the composition of the cloud covers of several of the planets; (2) provide structural information under favorable circumstances; (3) provide necessary data from which accurate thermodynamic data can be calculated; and (4) furnish information as to the nature of the potential energy function of the molecules and forces acting within them. Some of the molecules are produced photochemically from methane, ammonia, and hydrogen sulfide which are thought to be constituents of the planets with reducing atmospheres. Some of the compounds polymerize under ultraviolet radiation and drop out of the atmospheres. However, planets with a hot base, like that of Jupiter, may rebuild molecules destroyed photochemically. Author

N75-26951*# Scientific Translation Service, Santa Barbara, Calif.
COSMIC GLOW
A. I. Lazarev Washington NASA Jun. 1975 9 p Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 2, Mar.-Apr. 1975 p 9-13
(Contract NASw-2483)
(NASA-TT-F-16436) Avail: NTIS HC $3.25 CSCL 03B

The earth's nocturnal horizon and cosmic twilight, as observed by cosmonauts on board Soyuz 9, are discussed. Observations were made at a height of about 250 km in the area where the diurnal emission of the upper atmosphere hangs over a nocturnal luminous layer. Author

N75-26952# Wisconsin Univ., Madison. Mathematics Research Center.
TRIPLE COLLISION IN NEWTONIAN GRAVITATIONAL SYSTEMS Summary Report
Richard McGehee Oct. 1974 41 p refs
(Contract DA-ARO(D)-31-124-74-462); Grant NSF GP-38955)
(AD-A003719; MSR-TSR-1495) Avail: NTIS CSCL 03/3

The author describes the motions of Newtonian gravitational systems near triple collision. GRA

N75-26953# Owens Valley Radio Observatory, Pasadena, Calif.
OBSERVATIONS WITH A VLB ARRAY 1: INTRODUCTION AND PROCEDURES
M. H. Cohen, A. T. Moffett, J. D. Romney, R. T. Schilizzi, and D. B. Shaffer 1974 30 p refs Prepared in cooperation with Yale Univ.
(Contract N00014-67-A-0094-0019; Grant NSF GP-30400)

(AD-A004641; Rept-1974-15) Avail: NTIS CSCL 03/2

A series of observations is described, intended to investigate the structure and the time development of the structure of compact extragalactic radio sources at lambda = 2.8 cm and resolution 0.001 second. Discussed are the 5 telescopes, the sensitivity of the system, the calibration procedures, and modeling procedures. GRA

N75-26954# Owens Valley Radio Observatory, Pasadena, Calif.
OBSERVATIONS OF CARBON RECOMBINATION LINE EMISSION IN THE REFLECTION NEBULA M78
Robert L. Brown, G. R. Knapp, T. B. H. Kuiper, and Eva N.R. Kuiper 1974 12 p refs Prepared in cooperation with Natl. Radio Astronomy Obs.
(Contract N00014-67-A-0094-0019; Grant NSF GP-30400)
(AD-A004642; Rept-1974-16) Avail: NTIS CSCL 03/2

The C116 (alpha) and C142 (alpha) recombination lines have been detected in the reflection nebula M78. The line emission arises in a cold T approximately equal 20K CII Stromgren sphere ionized by HD38563N and S, the exciting stars of M78 that are embedded in the dark cloud L1630. The observed lines are extremely narrow, the full width at half maximum delta V - 1.3 km/s, making these the narrowest radio recombination lines yet detected. GRA

N75-26955# Owens Valley Radio Observatory, Pasadena, Calif.
VARIABLE RADIO SOURCE STRUCTURE ON A SCALE OF SEVERAL MINUTES OF ARC
Hugh N. Ross 1975 32 p refs
(Contract N00014-67-A-0094-0019)
(AD-A004640; Rept-1975-1) Avail: NTIS CSCL 03/2

During the course of high frequency flux density measurements on sources exhibiting low frequency cutoffs, at least three such sources 4C 79.4, 4C 79.15, 9 and PKS 2344-09, revealed structure on a scale ranging from a fraction of a minute of arc to as much as fifteen minutes of arc. This structure appears to change significantly on a time scale of several months. It is suggested that this variable structure arises from the existence of several centers that are highly variable in flux density, but fixed in position. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-26956 Colorado Univ., Boulder.
GEOLOGY OF THE NOACHIS QUADRANGLE, MARS Ph.D. Thesis
James Edward Peterson 1974 361 p
Avail: Univ. Microfilms Order No. 75-13460

Geological features of the Noachis Quadrangle of Mars were studied. Seven elevated craters and several closed depressions were mapped. Numerous irregular craters were noted. The Noachis Basin and the Hellas Basin were observed. The Noachis Basin is almost completely filled, perhaps by mare-like material. The Hellas Basin forms the eastern part of the quadrangle. The transition zone between the high plains of Helles-pontus and the basin floor contains a concentric system of ridges and scarps. Preliminary gravity data suggests that the Hellas Basin may be underlain by a mascon. Evidence of volcanism is extensive, including large calderas, cratered domes, and dozens of probable cinder cones and stratovolcanoes. As measured by crater densities the subjacent bedrock is very old. A dendritic system of tributary channels suggests past fluvial activity. Various eolian erosional and depositional features indicate prevailing wind directions. Hellas, a major fine sediment trap, is frequently the site of dust storms. Dissert Abstr

N75-26957*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETOSTATIC POTENTIAL THEORY AND THE LUNAR MAGNETIC DIPOLE FIELD
Melvyn L. Goldstein May 1975 7 p refs Submitted for publication
(NASA-TM-X-70919; X-692-75-142) Avail: NTIS HC $3.25 CSCL 03B

The lunar magnetic dipole moment is discussed. It is proposed that if a primordial core magnetic field existed, it would give rise to a present day nonzero external dipole magnetic field. This conclusion is based on the assumption that the lunar mantle is at least slightly ferromagnetic, and thus would maintain a permanent magnetization after the disappearance of the core magnetic field. Using a simple mathematical model of the moon, calculations are performed which support this hypothesis. D.M.L

N75-26958*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MARTIAN ATMOSPHERIC LEE WAVES
Joseph A. Pirraglia May 1975 35 p refs Submitted for publication
(NASA-TM-X-70915; X-622-75-123) Avail: NTIS HC $3.75 CSCL 03B

Mariner 9 television pictures of Mars extensive mountain lee wave phenomenon in the northern mid-latitudes during winter were evaluated. The characteristic wave length of the lee waves is readily observable, and in a few cases the boundaries of the wave patterns, as well as the wave length, are observed. The cloud patterns resulting from the waves generated by the flow across a mountain or crater are shown to be dependent upon the velocity profile of the air stream and the vertical stability of the atmosphere. Using the stability as inferred by the temperature structure obtained from the infrared spectrometer data, a two layer velocity model of the air stream is used in calculations based on the theory of mountain lee waves. Results yield magnitudes generally in agreement with various other circulation models. Author

N75-26959*# Kanner (Leo) Associates, Redwood City, Calif.
PHYSICS OF THE PLANET VENUS
A. D. Kuzmin and M. Ya. Marov Washington NASA Jun. 1975 334 p refs Transl. into ENGLISH of the book "Fizika Planety Venera" Moscow, Nauka Press, 1974 408 p
(Contract NASw-2481)
(NASA-TT-F-16226) Avail: NTIS HC $9.50 CSCL 03B

Data on the dimensions, figure, relief, rotation, surface physics, atmosphere, ionosphere and upper atmosphere of Venus are analyzed. These data were obtained from measurements made by spacecraft and ground-based instruments. Author

N75-26960# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ABSOLUTE INFRARED RADIANCE MEASUREMENTS OF VENUS AND JUPITER Environmental Research Papers
Lloyd M. Logan, Graham R. Hunt, Douglas A. Long, and Jens P. DybWad 15 Nov. 1974 11 p refs
(AF Proj. 7670)
(AD-A003662; AFCRL-ERP-494; AFCRL-TR-74-0573) Avail: NTIS CSCL 03/1

Balloon-borne measurements of brightness temperatures were made for Venus and Jupiter and are in general agreement with ground-based observations. In all these results, however, there remains a greater variation than can be explained by computed error margins. It is concluded that the absolute brightness temperatures reported here constitute a base from which the constancy of the radiation from Venus and Jupiter can be investigated to determine the usefulness of these planets as infrared calibration sources. GRA

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-26961 Catholic Univ. of America, Washington, D.C.
THE EFFECT OF ALFVENIC FLUCTUATIONS ON THE SOLAR

WIND Ph.D. Thesis
Tai-Hsin Chien 1974 131 p
Avail: Univ. Microfilms Order No. 75-13624

The major source of microscale fluctuations in the interplanetary medium due to the outwardly propagating Alfven waves is considered. The effect of the Alfven waves on the supersonic expansion of the solar wind is studied under the assumption that the motion of the interplanetary medium can be resolved physically into a comparatively smooth and slowly varying mesoscale flow and field with very irregular disordered incompressible microscale Alfvenic fluctuations superposed on it. The important features of the solar wind such as heat conduction flux, spiral interplanetary magnetic field, and proton thermal anisotropy are included in the theory. For inviscid, steady state, spherically symmetrical model of the solar wind, the two fluid formulation of the background mesoscale MHD equations is obtained. It contains the nonlinear terms due to the microscale fluctuations. When zeroth-order WKB solution is used, the amplitude vectors of the microscale fluctuations are functions of the background flow properties. Dissert. Abstr.

N75-26962 Stanford Univ., Calif.
TERMINATION OF THE SOLAR WIND IN THE HOT, PARTIALLY IONIZED INTERSTELLAR MEDIUM Ph.D. Thesis
Charles Klem Lombard 1975 154 p
Avail: Univ. Microfilms Order No. 75-13553

It is suggested that a simple extention of an existing analytical model provides a useful approximate description of the combined solar wind, interstellar wind plasma flowfield under conditions thought to occur. A linear perturbation solution exhibiting both the effects of photoionization and charge exchange is obtained for the supersonic solar wind. Investigation of the one-dimensional compressible flow equation and heating associated with polytrope solutions brings to light evidence that the classical coefficients of thermal conductivity for an ionized gas may be too high to describe the flow of the supersonic solar wind beyond earth. A model for the combined flow of the solar wind with the ionized component of the interstellar wind is formulated on the level of one-fluid magnetohydrodynamics. The model features quasi-normal, strong shock relations on a closed surface surrounding the sun and imbedded in the solar wind. Dissert. Abstr.

N75-26963# Army Tropic Test Center, APO New York 09827.
COMPUTATIONS OF DAILY SOLAR RADIATION ON INCLINED SURFACES
Wilfried H. Portig Nov. 1974 60 p refs
(DA Proj. 1T0-61101-A-91A)
(AD-A004007; USATTC-7411001) Avail: NTIS CSCL 04/1

The quantity of solar radiation impinging on the surface of materials is of extreme importance to scientists concerned with outdoor weathering of materials. Forecasting this solar radiation load and its effects is difficult because of the many factors (astronomical, atmospheric, and material surface conditions) that may alter the quality and quantity, and hence the effects of the incoming radiation. This report deals with the theoretical computation of the angle at which samples of materials should be exposed if they are to receive maximum solar radiation, taking into consideration only the uniqueness of the astronomical and surface position factors. Data summaries are presented that show the amount of radiation impinging on the surface of materials inclined at different angles for worldwide locations.
GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-26964*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PHOTONUCLEAR INTERACTIONS OF ULTRAHIGH ENERGY COSMIC RAYS AND THEIR ASTROPHYSICAL CONSEQUENCES
J. L. Puget, F. W. Stecker, and J. H. Bredekamp Jul. 1975 53 p refs Submitted for publication
(NASA-TM-X-70920; X-602-75-154) Avail: NTIS HC $4.25 CSCL 03B

Results of detailed Monte Carlo calculations of the interaction histories of ultrahigh energy cosmic-ray nuclei with intergalactic radiation fields are presented. Estimates of these fields and empirical determinations of photonuclear cross sections are used, including multinuclear disintegrations for nuclei up to 56Fe. Intergalactic and galactic energy loss rates and nucleon loss rates for nuclei up to 56Fe are also given. Astrophysical implications are discussed in terms of expected features in the cosmic-ray spectrum between quintillion and sextillion eV for the universal and supercluster origin hypotheses. The results of these calculations indicate that ultrahigh energy cosmic rays cannot be universal in origin regardless of whether they are protons or nuclei. Both the supercluster and galactic origin hypotheses, however, are possible regardless of nuclear composition.
Author

N75-26965# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
GEOMAGNETICALLY TRAPPED RADIATION Interim Report
Michael Schulz 17 Dec. 1974 118 p refs
(Contract F04701-74-C-0075)
(AD-A003751; TR-0075(5260-20)-2; SAMSO-TR-74-264)
Avail: NTIS CSCL 03/2

Contents: Adiabatic drift shells; Parasitic pitch-angle diffusion; Formation of inner electron belt: Artificial radiation belts; Empirical studies of particle diffusion; Inner-zone protons; Alpha-proton ratio; Cold-plasma injection.
GRA

99 GENERAL

N75-26966 Committee on Science and Technology (U. S. House).
ASTRONAUTS AND COSMONAUTS BIOGRAPHICAL AND STATISTICAL DATA
Washington GPO Jun. 1974 179 p Rept. prepared for Comm. on Sci. and Technol., 94th Congr., 1st Sess., Jun. 1975 Prepared by the Library of Congr., Sci. Policy Res. Div.
(GPO-52-999) Avail: Comm. on Sci. and Technol.

Biographical data is presented on all American astronauts and Soviet cosmonauts. Present and former astronauts of NASA, the X-15 joint NASA-Air Force program, the Air Force X-20 Dyna-Soar program, and the Air Force Manned Orbiting Laboratory are included. Tables are given on statistics of manned flights and time spent in orbit. Photographs are presented.
Author

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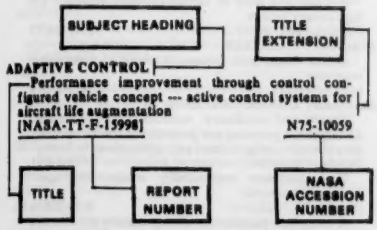

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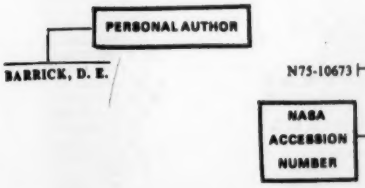

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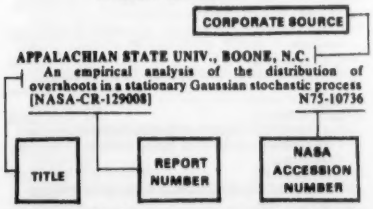
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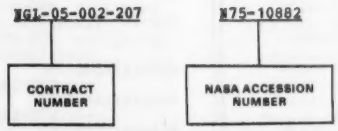

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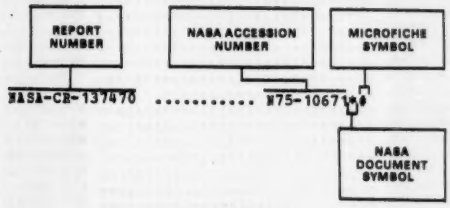

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NASA-TM-X-64944 ..... N75-26889*#
NASA-TM-X-66871 ..... N75-26472*#
NASA-TM-X-70914 ..... N75-26842*#
NASA-TM-X-70915 ..... N75-26958*#
NASA-TM-X-70917 ..... N75-26942*#
NASA-TM-X-70919 ..... N75-26957*#
NASA-TM-X-70920 ..... N75-26964*#
NASA-TM-X-71712 ..... N75-26315*#
NASA-TM-X-71741 ..... N75-25944*#
NASA-TM-X-71743 ..... N75-26375*#
NASA-TM-X-71745 ..... N75-26497*#
NASA-TM-X-71746 ..... N75-25947*#
NASA-TM-X-71747 ..... N75-26058*#
NASA-TM-X-71748 ..... N75-26377*#
NASA-TM-X-71750 ..... N75-25945*#
NASA-TM-X-71752 ..... N75-26500*#
NASA-TM-X-71760 ..... N75-26314*#
NASA-TM-X-71762 ..... N75-26306*#
NASA-TM-X-71763 ..... N75-25948*#
NASA-TM-X-72661 ..... N75-25995*#
NASA-TM-X-72667 ..... N75-26312*#
NASA-TM-X-72704 ..... N75-26415*#
NASA-TM-X-72707 ..... N75-25870*#
NASA-TM-X-72714 ..... N75-26338*#

NASA-TN-D-7916 ..... N75-26311*#
NASA-TN-D-7968 ..... N75-25981*#
NASA-TN-D-7969 ..... N75-25980*#
NASA-TN-D-7984 ..... N75-25869*#
NASA-TN-D-8004 ..... N75-26093*#
NASA-TN-D-8006 ..... N75-26137*#

NASA-TT-F-15764 ..... N75-25918*#
NASA-TT-F-16226 ..... N75-26959*#
NASA-TT-F-16264 ..... N75-25982*#
NASA-TT-F-16331 ..... N75-26638*#
NASA-TT-F-16370 ..... N75-25989*#
NASA-TT-F-16411 ..... N75-26632*#
NASA-TT-F-16412 ..... N75-26060*#
NASA-TT-F-16413 ..... N75-26557*#
NASA-TT-F-16422 ..... N75-26639*#
NASA-TT-F-16426 ..... N75-26822*#
NASA-TT-F-16428-PT-2 ..... N75-26744*#
NASA-TT-F-16429 ..... N75-26800*#
NASA-TT-F-16430 ..... N75-26801*#
NASA-TT-F-16432 ..... N75-26637*#
NASA-TT-F-16434 ..... N75-26368*#
NASA-TT-F-16436 ..... N75-26951*#
NASA-TT-F-16437 ..... N75-25983*#
NASA-TT-F-16438 ..... N75-25984*#
NASA-TT-F-16440 ..... N75-26030*#
NASA-TT-F-16446 ..... N75-26149*#
NASA-TT-F-16447 ..... N75-26150*#

NASA-TT-F-16451 ..... N75-26253*#
NASA-TT-F-16463 ..... N75-26634*#

NAVWESA-R-746 ..... N75-26907 #

NBS-SP-260-46 ..... N75-26131 #

NBS-TN-664 ..... N75-26509 #
NBS-TN-666 ..... N75-26650 #
NBS-TN-854 ..... N75-26074 #
NBS-TN-861 ..... N75-26915 #

NBSIR-73-177 ..... N75-26147 #
NBSIR-74-583 ..... N75-26113 #
NBSIR-75-672 ..... N75-26279 #

NCEMP-25 ..... N75-26511 #
NCEMP-27 ..... N75-26516 #
NCEMP-28 ..... N75-26518 #
NCEMP-29 ..... N75-26517 #

NEAR-TR-76 ..... N75-25893 #

NEDU-23-74 ..... N75-26669 #

NELC/TD-355 ..... N75-26728 #
NELC/TD-374 ..... N75-26214 #
NELC/TD-379 ..... N75-26215 #
NELC/TD-381 ..... N75-26229 #

NF-52/5-75 ..... N75-25987*#

NIH-DCRT-DHB-SSS-AN502 ..... N75-26718 #

NOAA-75021104 ..... N75-26484 #

NOLTR-74-134 ..... N75-25890 #
NOLTR-74-172 ..... N75-26145 #
NOLTR-74-174 ..... N75-26534 #
NOLTR-74-214 ..... N75-26266 #

NOSL-MT-014 ..... N75-26351 #

NPS-51MC74091 ..... N75-26605 #
NPS-53AC74121 ..... N75-26750 #
NPS-53JX74121 ..... N75-26747 #
NPS-55JO74061 ..... N75-26919 #
NPS-55JO74121 ..... N75-26922 #
NPS-55LW74071 ..... N75-26751 #
NPS-55SY74101 ..... N75-26752 #
NPS-57BP74071 ..... N75-25922 #

NRC-14579 ..... N75-26308 #
NRC-14649 ..... N75-26376 #

NRL-MR-2818 ..... N75-26875 #
NRL-MR-2933 ..... N75-26592 #
NRL-MR-2938 ..... N75-26687 #
NRL-MR-2946 ..... N75-26877 #
NRL-MR-2958 ..... N75-26590 #
NRL-MR-2959 ..... N75-26878 #
NRL-MR-2961 ..... N75-26591 #
NRL-MR-2962 ..... N75-26874 #
NRL-MR-2963 ..... N75-26566 #
NRL-MR-2967 ..... N75-26593 #
NRL-MR-2968 ..... N75-26617 #
NRL-MR-2970 ..... N75-26850 #
NRL-MR-2974 ..... N75-26817 #

NRL-7797 ..... N75-26714 #
NRL-7815 ..... N75-26816 #
NRL-7834 ..... N75-26107 #

NSF/RA/N-73-005-A ..... N75-26522 #
NSF/RA/N-73-005-B ..... N75-26521 #
NSF/RA/N-74-060 ..... N75-26524 #
NSF/RA/N-74-064 ..... N75-26505 #
NSF/RA/N-74-118 ..... N75-26512 #
NSF/RA/N-74-122 ..... N75-26510 #
NSF/RA/N-74-132 ..... N75-26485 #
NSF/RA/N-74-152 ..... N75-26504 #
NSF/RA/N-74-152(1) ..... N75-26511 #
NSF/RA/N-74-152(3) ..... N75-26520 #
NSF/RA/N-74-152(5) ..... N75-26519 #
NSF/RA/N-74-152(8) ..... N75-26518 #
NSF/RA/N-74-152(9) ..... N75-26517 #
NSF/RA/S-74-019 ..... N75-26906 #
NSF/RANN/SE/GI-27976/PR-73-5 ..... N75-26521 #

NSF/RANN/SE/GI-27976/PR-73-5 ..... N75-26522 #
NSF/RANN/SE/GI-27976/TR-73-1 ..... N75-26520 #
NSF/RANN/SE/GI-29729/PR-74-2 ..... N75-26504 #
NSF/RANN/SE/GI-29729X/PR-74-2 ..... N75-26519 #

NSRDC-4356 ..... N75-26807 #
NSRDC-4391 ..... N75-26426 #
NSRDC-4588 ..... N75-26700 #

NUB-2262 ..... N75-26841 #

NUC-TP-404-VOL-1 ..... N75-26808 #
NUC-TP-433 ..... N75-26325 #

NUSO-TR-4867 ..... N75-26804 #

OAS-TR-74-252 ..... N75-26587 #

ONRL-C-6-74 ..... N75-26886 #

ORC-74-32 ..... N75-26748 #
ORC-74-35 ..... N75-26701 #

OSURF-2966-TR-9 ..... N75-26120 #
OSURF-3194-F ..... N75-26110 #
OSURF-3360-1 ..... N75-26115 #

OUEL-1083/74 ..... N75-26318 #
OUEL-1109/74 ..... N75-26319 #
OUEL-1111/74 ..... N75-26419 #
OUEL-1112/74 ..... N75-26790 #
OUEL-1115/75 ..... N75-26193 #

OWRT-A-046-OKLA(1) ..... N75-26063 #
OWRT-A-047-GA(1)-PT-2 ..... N75-26602 #
OWRT-A-047-GA(1)-PT-3 ..... N75-26602 #
OWRT-A-999-MINN(33) ..... N75-26515 #

OWRT-B-067-ILL(1) ..... N75-26317 #

OWRT-C-5340(9088)(1) ..... N75-26612 #

OWRT-W-180(4258)(1) ..... N75-26550 #

OWRTA-047-GA(1)-PT-1 ..... N75-26602 #

PA-00817 ..... N75-26202*#

PB-239160/5 ..... N75-26628 #
PB-239164/7 ..... N75-26513 #
PB-239338/7 ..... N75-26504 #
PB-239394/0 ..... N75-26522 #
PB-239395/7 ..... N75-26521 #
PB-239408/8 ..... N75-26523 #
PB-239416/1 ..... N75-26545 #
PB-239516/8 ..... N75-26505 #
PB-239579/6 ..... N75-26486 #
PB-239580/4 ..... N75-26487 #
PB-239581/2 ..... N75-26488 #
PB-239582/0 ..... N73-26489 #
PB-239583/8 ..... N75-26490 #
PB-239584/6 ..... N75-26546 #
PB-239607/5 ..... N75-26524 #
PB-239609/1 ..... N75-26132 #
PB-239693/5 ..... N75-26539 #
PB-239710/7 ..... N75-26514 #
PB-239718/0 ..... N75-26485 #
PB-239727/1 ..... N75-26541 #
PB-239745/3 ..... N75-26542 #
PB-239746/1 ..... N75-26543 #
PB-239756/0 ..... N75-26511 #
PB-239758/6 ..... N75-26520 #
PB-239760/2 ..... N75-26519 #
PB-239762/8 ..... N75-26516 #
PB-239763/6 ..... N75-26518 #
PB-239764/4 ..... N75-26517 #
PB-239767/7 ..... N75-26526 #
PB-239768/5 ..... N75-26527 #
PB-239770/1 ..... N75-26538 #
PB-239848/5 ..... N75-26358 #
PB-239865/9 ..... N75-26933 #
PB-239880/8 ..... N75-26551 #
PB-239933/5 ..... N75-26081 #
PB-239937/6 ..... N75-26602 #
PB-239941/8 ..... N75-26501 #
PB-239944/2 ..... N75-26544 #
PB-239951/7 ..... N75-26612 #
PB-239961/6 ..... N75-26515 #
PB-239993/9 ..... N75-26317 #

PB-240008/3 ..... N75-26550 #
PB-240100/8 ..... N75-26082 #
PB-240115/6 ..... N75-26718 #
PB-240131/3 ..... N75-26549 #
PB-240132/1 ..... N75-26080 #
PB-240142/0 ..... N75-26439 #
PB-240146/1 ..... N75-26932 #
PB-240147/9 ..... N75-26097 #
PB-240148/7 ..... N75-26440 #
PB-240153/7 ..... N75-26483 #
PB-240157/8 ..... N75-26063 #
PB-240168/5 ..... N75-26540 #
PB-240170 ..... N75-26611 #
PB-240262/6 ..... N75-26391 #
PB-240285/7 ..... N75-26613 #
PB-240309/5 ..... N75-26548 #
PB-240346/7 ..... N75-26547 #
PB-240609/8 ..... N75-26512 #
PB-240611/4 ..... N75-26510 #
PB-240613/0 ..... N75-26525 #
PB-240655/1 ..... N75-26906 #
PB-240797/1 ..... N75-26280 #

PR-3 ..... N75-26485 #
PR-4 ..... N75-26524 #
PR-23 ..... N75-26459*#

PTR-2115 ..... N75-25939 #

PUB-LAW-94-39 ..... N75-26926 #

PWA-FR-6583 ..... N75-25950 #

PWA-5201 ..... N75-26496*#

QAQPS-1.2-018 ..... N75-26546 #

QR-3 ..... N75-26579 #
QR-4 ..... N75-26583 #
QR-6 ..... N75-26269 #

R-845 ..... N75-26580 #
R-873 ..... N75-26417*#
R-874 ..... N75-26416*#
R-9655 ..... N75-26008*#

RADC-TR-73-217-VOL-1 ..... N75-26260 #
RADC-TR-74-307 ..... N75-26270 #
RADC-TR-74-311 ..... N75-26271 #
RADC-TR-74-313 ..... N75-26393 #
RADC-TR-74-316 ..... N75-26322 #
RADC-TR-74-318 ..... N75-26233 #
RADC-TR-74-323 ..... N75-26683 #
RADC-TR-74-324 ..... N75-26239 #
RADC-TR-74-327 ..... N75-26234 #
RADC-TR-75-7 ..... N75-26129 #

RC-5137 ..... N75-26704 #

REPT-2 ..... N75-26651*#
REPT-3 ..... N75-26652*#
REPT-3 ..... N75-26739*#
REPT-9 ..... N75-26894 #
REPT-12 ..... N75-26073 #
REPT-24 ..... N75-26382 #
REPT-32 ..... N75-26950*#
REPT-38 ..... N75-26742*#
REPT-39 ..... N75-26743*#
REPT-41 ..... N75-26741*#
REPT-42 ..... N75-26740*#
REPT-51/1974 ..... N75-26410
REPT-74-1 ..... N75-26714 #
REPT-74-3 ..... N75-25973 #
REPT-74-18 ..... N75-26421 #
REPT-151 ..... N75-26641 #
REPT-209 ..... N75-26208 #
REPT-220 ..... N75-26696 #
REPT-221 ..... N75-26697 #
REPT-222 ..... N75-26209 #
REPT-428-740930 ..... N75-26355 #
REPT-623-PT-1 ..... N75-26152 #
REPT-625 ..... N75-26600 #
REPT-1974-15 ..... N75-26953 #
REPT-1974-16 ..... N75-26954 #
REPT-1975-1 ..... N75-26955 #
REPT-5015 ..... N75-26891 #
REPT-5098 ..... N75-26904 #
REPT-5137 ..... N75-26885 #
REPT-7466R/20 ..... N75-26210 #

REPT-80003 ..... N75-25926 #
REPT-441700-1 ..... N75-26332 #

RESOURCE-IP-6 ..... N75-26550 #

RIA-R-TR-74-040 ..... N75-25920 #

RR-124 ..... N75-26943 #

RSL-TR-177-37 ..... N75-26846*#
RSL-TR-177-47 ..... N75-26555*#
RSL-TR-177-52 ..... N75-26478*#
RSL-TR-177-53 ..... N75-26614*#

RSR-75-2 ..... N75-26482*#

RUB-AI-2 ..... N75-26944 #

R74-AEG393 ..... N75-25951 #

S-17990 ..... N75-26364 #

SACLANTCEN-CONF-PROC-14 ..... N75-26818 #

SACLANTCEN-SM-55 ..... N75-26276 #

SAD-89E-1942 ..... N75-26329 #

SAI-73-510-AQ ..... N75-25969 #

SAM-REVIEW-8-74 ..... N75-26649 #

SAM-TR-74-37 ..... N75-26225 #
SAM-TR-74-44 ..... N75-26649 #
SAM-TR-74-47 ..... N75-26369 #
SAM-TR-74-54 ..... N75-25954 #

SAMSO-TR-74-244 ..... N75-25902 #
SAMSO-TR-74-247 ..... N75-26589 #
SAMSO-TR-74-250 ..... N75-26005 #
SAMSO-TR-74-254 ..... N75-26844 #
SAMSO-TR-74-256 ..... N75-26826 #
SAMSO-TR-74-264 ..... N75-26965 #
SAMSO-TR-74-268 ..... N75-26574 #
SAMSO-TR-74-269 ..... N75-26506 #
SAMSO-TR-74-273 ..... N75-26498 #
SAMSO-TR-74-277 ..... N75-26363 #
SAMSO-TR-74-287 ..... N75-26827 #
SAMSO-TR-75-1 ..... N75-26829 #
SAMSO-TR-75-3 ..... N75-26722 #
SAMSO-TR-75-6 ..... N75-26706 #
SAMSO-TR-75-11 ..... N75-26354 #
SAMSO-TR-75-12 ..... N75-26707 #
SAMSO-TR-75-13 ..... N75-26708 #
SAMSO-TR-75-18 ..... N75-25880 #
SAMSO-TR-75-24 ..... N75-26851 #
SAMSO-TR-75-73-VOL-1 ..... N75-25906 #
SAMSO-TR-75-73-VOL-4 ..... N75-25908 #
SAMSO-TR-75-73-VOL-5 ..... N75-25909 #
SAMSO-TR-75-73-VOL-6 ..... N75-25910 #

SAO-409-090 ..... N75-26625 #

SAPR-1 ..... N75-26519 #
SAPR-1 ..... N75-26897 #

SAR-7 ..... N75-25872*#
SAR-16 ..... N75-26859*#

SASR-6 ..... N75-26062*#

SATR-2 ..... N75-26366 #
SATR-2 ..... N75-26892 #
SATR-3 ..... N75-26597 #

SCG-50096R ..... N75-26361*#

SCIENTIFIC-3 ..... N75-26870 #

SC563.10SATR ..... N75-26892 #
SC595.21TR ..... N75-26394 #

SDAC-TR-74-6 ..... N75-26565 #

SPO-30284 ..... N75-26342*#
SPO-30284-00800 ..... N75-26341*#

SR-2 ..... N75-26608 #
SR-2 ..... N75-26872 #
SR-3 ..... N75-26226 #
SR-3 ..... N75-26869 #
SR-4 ..... N75-25875 #
SR-4 ..... N75-26899 #
SR-16 ..... N75-26582 #

SRD-74-079 ..... N75-26127 #

SRL-TR-74-0014 ..... N75-26581 #

SSM-7405 ..... N75-26754 #

SSS-R-75-2483 ..... N75-26596 #

SU-AIM-227 ..... N75-26655 #
SU-AIM-243 ..... N75-26698 #

SU-DMS-75-T-10 ..... N75-26109 #

SU-HEPL-746 ..... N75-26277 #

SU-IPR-630 ..... N75-26859*#

SU-SGT-TR-1 ..... N75-26485 #

SU-STAN-CS-74-408 ..... N75-26655 #
SU-STAN-CS-74-456 ..... N75-26698 #
SU-STAN-CS-74-464 ..... N75-26729 #

SVHSER-6523 ..... N75-26666*#
SVHSER-6534 ..... N75-26310*#

SWRI-02-3618-F ..... N75-26118 #

T-308 ..... N75-26774 #

TACOM-TR-11926 ..... N75-26068 #

TAE-221 ..... N75-25875 #

TEES-3029-75-01 ..... N75-25891 #

THEMIS-TR-48 ..... N75-26910 #

TI-ALEX(01)-QR-74-03 ..... N75-26579 #
TI-ALEX(01)-QR-74-04 ..... N75-26583 #
TI-ALEX(02)-TR-74-03-PT-B ..... N75-26597 #

TI-03-74-59 ..... N75-26269 #

TM-74-267 ..... N75-26323 #

TN-1974-54 ..... N75-26224 #
TN-1974-59 ..... N75-26237 #

TR-PL-10433 ..... N75-26159 #

TR-1 ..... N75-26066 #
TR-1 ..... N75-26618 #
TR-2 ..... N75-26234 #
TR-2 ..... N75-26569 #
TR-6 ..... N75-26117 #
TR-6 ..... N75-26644 #
TR-12 ..... N75-26111 #
TR-12 ..... N75-26438 #
TR-24 ..... N75-26263 #
TR-26 ..... N75-26619 #
TR-31 ..... N75-26626 #
TR-32 ..... N75-26616 #
TR-47 ..... N75-26753 #
TR-49 ..... N75-26705 #
TR-74-1 ..... N75-26757 #
TR-74-4 ..... N75-26726 #
TR-86 ..... N75-26611 #
TR-87 ..... N75-26806 #
TR-89 ..... N75-26805 #
TR-342 ..... N75-26717 #
TR-344 ..... N75-26734 #
TR-512 ..... N75-26792 #
TR-657 ..... N75-26732 #
TR-0075(5112)-2 ..... N75-26722 #
TR-0075(5112)-4 ..... N75-26706 #
TR-0075(5112)-5 ..... N75-26708 #
TR-0075(5240-10)-1 ..... N75-26363 #
TR-0075(5250-30)-4 ..... N75-26844 #
TR-0075(5260-20)-2 ..... N75-26965 #
TR-0075(5270-10)-2 ..... N75-26506 #
TR-0075(5270-20)-1 ..... N75-26826 #
TR-0075(5450-38)-1 ..... N75-26354 #

TR-0075(5484)-2 ..... N75-26851 #
TR-0075(5530)-3 ..... N75-26827 #
TR-0075(5647)-3 ..... N75-26589 #
TR-0075(5901-01)-2 ..... N75-26005 #
TR-0075(5901-01)-3 ..... N75-25880 #
TR-0075(5901-02)-2 ..... N75-26498 #
TR-0075(5901-03)-5 ..... N75-26707 #
TR-0075(9270-01)-3 ..... N75-26829 #
TR-0075(9270-01)-4 ..... N75-26574 #

TRW-22591-6001-RU-00-VOL-1 ..... N75-26470*#
TRW-22591-6001-RU-00-VOL-2 ..... N75-26471*#
TRW-23850-6023-TU-00 ..... N75-25902 #
TRW-26628-6921-001 ..... N75-26679 #

TSC-OSR-74-15 ..... N75-26595 #

TSR-5 ..... N75-26113 #

TT-70-57216 ..... N75-26503 #
TT-71-51025 ..... N75-26143 #
TT-72-51030 ..... N75-26126 #
TT-72-58026 ..... N75-26686 #
TT-72-58029 ..... N75-26123 #
TT-74-50032 ..... N75-26162 #
TT-74-53073 ..... N75-26100 #
TT-74-53089 ..... N75-26103 #
TT-74-53233 ..... N75-26106 #
TT-74-58000 ..... N75-26124 #
TT-74-58006 ..... N75-26125 #
TT-74-58008 ..... N75-26098 #
TT-74-58009 ..... N75-26102 #
TT-74-58011 ..... N75-26105 #
TT-74-58013 ..... N75-26099 #
TT-74-58020 ..... N75-26101 #
TT-74-58023 ..... N75-26104 #

TTI-2-8-69-138-6 ..... N75-26391 #

TUM-LRT-DH-2 ..... N75-26009 #

TUM-LRT-KB-2 ..... N75-26010 #
TUM-LRT-KB-3 ..... N75-26001 #

TUM-LRT-TB-1 ..... N75-26002 #
TUM-LRT-TB-4 ..... N75-26866 #
TUM-LRT-TB-7 ..... N75-26011*#
TUM-LRT-TB-8 ..... N75-25992 #
TUM-LRT-TB-10-PT-2 ..... N75-26012 #
TUM-LRT-TB-11-PT-3 ..... N75-26013 #
TUM-LRT-TB-14 ..... N75-26014 #
TUM-LRT-TB-15 ..... N75-26015 #
TUM-LRT-TB-17 ..... N75-26016 #
TUM-LRT-TB-18 ..... N75-25990 #
TUM-LRT-TB-19 ..... N75-26017 #
TUM-LRT-TB-20 ..... N75-26320 #

U-OF-IOWA-75-15 ..... N75-26937*#

U-6095 ..... N75-26070 #
U-6124 ..... N75-26038 #

UAG-R-229 ..... N75-26573 #

UAH-RR-161-VOL-1 ..... N75-26433 #
UAH-RR-162-VOL-2 ..... N75-26434 #
UAH-RR-171 ..... N75-26917*#

UCLA-ENG-7466 ..... N75-26427 #

UDRI-TR-74-26 ..... N75-25952 #
UDRI-TR-74-27 ..... N75-26122 #

UIEL-74-16 ..... N75-26856 #

UILU-ENG-74-2559 ..... N75-26856 #
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UM/RAO-75-2 ..... N75-25991*#

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